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BY

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A REVIEW OF THE FISHES OF THE FAMILIES LOBOTIDÆ AND LUTIANIDÆ, FOUND IN THE WATERS OF JAPAN.

By David Starr Jordan and William Francis Thompson,
Of Stanford University, California.

In the present paper an account is given of the Japanese species of percoid fishes constituting the family of Lobotidæ, or triple-tails, and the family of Lutianidæ, or snappers. It is based on material obtained in Japan in 1900, by Professors Jordan and Snyder, and now divided between the United States National Museum and the Museum of Stanford University.

The drawings for figures 2, 3, and 4 were made by Mr. Sekko Shimada.

Family LOBOTIDÆ.

The TRIPLE-TAILS.

Bass-like fishes, with an oblong, compressed body, equally developed above and below; a short snout and anterior eyes; edentulous palate; dorsal and anal with the soft portions equal and opposite, the former preceded by a much longer spinous portion, the latter with 3 spines; vertebræ 24, 12 abdominal and 12 caudal, the fifth to eleventh with short but gradually lengthening parapophyses projecting sideways and behind downward, and the twelfth with the parapophyses elongated, converging at their extremities, and fitting into a groove of the first hæmal spine, the costiferous pits excavated obliquely in the developed parapophyses, and gradually ascending forward on the vertebræ, and finally on the neurapophyses; the skull with its frontal portion broad, expanded forward and outward, and entering into the posterior borders of the orbits, which are advanced far forward; the postfrontals elongated forward and underlying the frontals; ethmoid short, decurved, and expanded sideways (Gill). This family contains but two species, large fishes closely allied to the Serranidæ, but lacking vomerine and palatine teeth, and with the fore part of the head very short. Its relations are decidedly with the Serranidæ and not with the Hæmulidæ with which group it agrees in the absence of teeth on the palate.

1. Genus LOBOTES Cuvier.

Lobotes CUVIER, Règne Animal, ed. 2, vol. 2, 1829, p. 177 (*erate=surinamensis*).

Body oblong, compressed and elevated, covered with moderate-sized, weakly ctenoid scales; profile of head concave, the snout prominent; mouth moderate, oblique, with thick lips; upper jaw very protractile, the lower the longer; maxillary without supplemental bone; jaws with narrow bands of villiform teeth, in front of which is a row of larger conical teeth directed backward; no teeth on vomer or palatines; preorbital narrower than eye; preopercle strongly serrate, the serræ becoming smaller with age. Branchiostegals 6. Dorsal fin continuous, with 12 spines which may be depressed in a shallow groove; soft rays of dorsal and anal fins elevated; anal spines graduated; bases of soft dorsal and anal thickened and scaly; caudal rounded. Air bladder present. Pyloric cæca 3.

(*λοβοτός* lobed; the soft parts of dorsal, anal, and caudal thought to resemble one three-lobed fin.)

1. LOBOTES SURINAMENSIS (Bloch).

Holocentrus surinamensis BLOCH, Ichthyologia, pt. 7, pl. 243, 1790 (Surinam).

Lobotes surinamensis CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 5, 1830, p. 319 (after Bloch).—HOLBROOK, Ichth. South Carolina, 1860, p. 169, pl. 24, fig. 2 (South Carolina).—DAY, Fishes India, 1875, p. 84, pl. 21, fig. 5 (India).—POEY, Fauna Puerto Riqueña, 1881, p. 329 (Porto Rico).—JORDAN and EVERMANN, Fishes North and Middle America, vol. 1, 1896, p. 1235, pl. 194, fig. 510.—JORDAN and RUTTER, Proc. Acad. Nat. Sci. Phila., 1897, p. 112 (Kingston, Jamaica).—EVERMANN and MARSH, Bull. U. S. Fish Comm., 1900, p. 164, fig. 47 (San Juan, Porto Rico), and of authors generally.

Bodianus triurus MITCHILL, Trans. Amer. Philos. Soc., 1815, p. 418, pl. 3, fig. 10 (Powles Hook, New Jersey).

Lobotes erate CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 5, 1830, p. 322 (Pondicherry).—BLEEKER, Verh. Bat. Gen. Kunst. Wet., vol. 23, Sciæn., 1849, p. 26; Atlas Ich., Perc., pl. 23, fig. 4 (Batavia, Samarang, Surabaya).—CANTOR, Cat. Malay Fish., 1850, p. 80 (Sea of Pinang, Malayan Peninsular coasts, Singapore).

Lobotes farkhari CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 5, 1830, p. 324 (on a drawing), (Malacca).

Lobotes somnolentus CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 5, 1830, p. 324, pl. 126 (Santo Domingo).

Lobotes incurvus RICHARDSON, Ich. China, 1846, p. 237. (Hong Kong.)

Lobotes auctorum GÜNTHER, Cat. Fish Brit. Mus., vol. 7, 1859, p. 338 (Cuba, Calcutta, China).

Habitat.—Atlantic coast of America from Cape Cod to Brazil, Madagascar, and East Indies, north to Japan.

Description.—Of a specimen from Misaki, 48 cm. in total length.

Head $2\frac{5}{6}$ in body, $3\frac{1}{2}$ in total; depth $2\frac{1}{6}$ in length; maxillary $2\frac{3}{4}$ in head; longitudinal diameter of eye 8; interorbital space (bone, above

pupils) 3; snout 4; D. XII, 15; A. III, 11; scales in longitudinal series above lateral line to last vertebra 45; in series below 40; on lateral line 42; in transverse series 10/16; gill rakers 6 + 13; length of longest one-half diameter of eye.

Body deep; dorsal and ventral profiles similar and symmetrical; compressed; caudal peduncle deep, $2\frac{1}{6}$ in head, its length from last anal rays to base of caudal 3 in head; head slightly concave in profile back of interorbital area, strongly convex from side to side; snout very much rounded, broad, its length less than its width; suborbitals very narrow, less than half width of the small eye; lower jaw longer; maxillary extending to below posterior border of eye; mouth cleft very oblique, at about 40° to body axis, its tip at lower level of eye, laterally fully the diameter of the eye below. Teeth in outer rows of both jaws conical, not at all compressed nor canine-like, rather closely set. Inner band of upper jaw broader anteriorly than that of lower, both becoming narrower posteriorly, those above being of five or six rows in front, those below three or four; outer row teeth stoutly conical, somewhat enlarged.

Preopercle set with bony teeth, projecting little beyond bony margin, making rather coarse serrations, stronger at the slightly projecting angle, small and pointing upward on dorsal half of posterior border; downward on lower border, but lacking on anterior half of latter, the remainder small. Portion of posterior border of interopercle and whole free edge of subopercle finely serrated, as is the clavicle and the posttemporal. These serrations are much larger in young examples.

Dorsal spines longest in fourth and fifth, about $2\frac{3}{4}$ times in head, stout and strong. Spinous dorsal base $2\frac{2}{5}$ in body to base of caudal, soft dorsal $3\frac{2}{3}$. Anal spines graduated, third and longest, about 4 times in head; soft anal rounded; anal base four in length to base of caudal.

Lateral line following line of back, arched strongly anteriorly, the tubes simple, large.

Scales thick and bony, rather large and coarse, slightly ctenoid; covering basal halves of soft dorsal and anal and basal third of caudal; those on head and cheeks much smaller; those on opercle in seven rows, of eight or nine scales along border, on subopercle in one lengthwise row of six or seven, on interopercle in one of ten or eleven, with two partial rows. Scales lacking on snout before nostrils, on lips and lower jaw.

Color dark olive, especially dark on head. Lining of gill cavity and peritoneum clear; distal part of caudal fin paler. In life, blackish above, silver gray below, often blotched or tinged with yellow.

Of this species of wide distribution in the warm seas, one specimen only is known from Japan. This was found dead on the beach at

Misaki, near the Zoological Station of the Imperial University, in August, 1900. This specimen, now before us, is typical of *Lobotes erate* Cuvier and Valenciennes. We are, however, wholly unable to separate this nominal species from the common *Lobotes surinamensis* of the western Atlantic.

On careful comparison of specimens and published plates, we can not find any difference which will hold. The denticulations on the preopercle are subject to much variation, and become much less distinct with age, being long and prominent in the young. Small specimens of *L. surinamensis* from Jamaica and Charleston, South Carolina, in the Museum of Stanford University, show a somewhat greater depth, but this character is not borne out by the observations of other authors on adults from the same localities, and it is very probable that the depth in this species grows less with age. These facts account for the differences held to exist between the species.

Lobotes pacificus Gilbert, from Panama (cotypes in the Stanford Museum), must be regarded as a distinct species, having much smaller preopercular spines, even in the young, and narrower suborbital bones. A specimen described by Sauvage from Madagascar as *L. surinamensis* has large preopercular spines, notwithstanding a total length of 2 feet, as shown by the indicated scale on the plate. If this is correct, it may be a different species.

2. Family LUTIANIDÆ.

THE SNAPPERS.

Body oblong or more or less elevated, covered with moderate-sized adherent scales, which are more or less strongly ctenoid or almost cycloid. Lateral line well developed, concurrent with the back, usually not extending on the caudal fin. Head large, the crests on the skull usually well developed. No suborbital stay. Mouth moderate or large, usually terminal, low and horizontal; premaxillaries moderately protractile, their spines not extending to the occiput; maxillary long, without supplemental bone (except in *Doderleinia* and *Glaucosoma*, genera allied to the Serranidæ), for most of its length slipping under the edge of the preorbital, which forms a distinct sheath (except in the genera just named); teeth various, usually unequal and sharp, never incisor-like, sometimes deciduous, some of them sometimes molar; vomer and palatines with villiform teeth (these deciduous or wanting in *Aphareus*), sometimes molar, sometimes very small, sometimes wanting, tongue usually with a band of teeth; lower pharyngeals separate; gills 4, a slit behind the fourth; pseudobranchiæ large; gill rakers moderate or long, slender; gill membranes separate, free from the isthmus. Preopercle serrate or entire;

opercle without spines (in typical species); sides of head scaly. Dorsal fin single, continuous, or deeply notched, sometimes divided into two fins, the spines usually strong, depressible in a groove, and heteracanthous, that is, alternating, the one stronger on the right side, the other on the left; the spines 10 to 12 in number. Anal fin similar to soft dorsal and with three spines; ventral fins thoracic, the rays I, 5, with a more or less distinct scale-like appendage at base; caudal fin usually more or less concave or forked. Air-bladder present, usually simple. Intestinal canal short. Pyloric cæca few. Vertebræ usually 10 + 14 = 24. No distinct tubercles from the cranium for the articulation of the epipharyngeal bones; enlarged apophyses for the articulation of palatine and preorbital bones; anterior 4 vertebræ without parapophyses. The family comprises about 20 genera and some 250 species, chiefly inhabiting the shores of warm regions. All of them are valued as food, and all are active, carnivorous, and voracious. The group is closely related to the Serranidæ on the one hand and to the Hæmulidæ on the other.

We here exclude from the Lutianidæ the genus *Xenichthys* and its relatives, more nearly allied to the Hæmulidæ, and also the genera *Dentex*, *Nemipterus*, and *Gymnocranius*, which approach the Sparidæ. *Doderleinia* and *Glaucosoma* should doubtless also be excluded, as more nearly related to the Serranidæ.

In Japan the family is not largely represented, either in number of species or in number of individuals, but two species being abundant enough to have commercial value.

a^1. Maxillary broad, scaly, with a distinct supplemental bone; maxillary scarcely sheathed by the preorbital; gill rakers long and slender (genera allied to the Anthiinæ among the Serranidæ).

b^1. GLAUCOSOMATINÆ. Teeth in bands, without distinct canines; supplementary maxillary narrow; preopercle coarsely toothed; pectoral fins short; caudal lunate; scales moderate; head entirely scaly; lateral line extending on caudal; dorsal continuous, with graduated spines; soft dorsal and anal scaly at base. *Glaucosoma*, 2.

b^2. DODERLEINIINÆ. Teeth unequal, canines moderate, numerous; skull essentially as in *Etelis*, the supraoccipital not encroaching on the cranium; supplemental maxillary broad; dorsal deeply notched, with 10 spines; soft dorsal and anal scaleless; scales large; pectorals long but not falcate..*Doderleinia*, 3.

a^2. Maxillary without supplemental bone.

c^1. Vomer and palatines with teeth.

d^1. Nostrils near together, placed just before eye, the anterior not tubular; vomerine teeth villiform, the patch ⋀, ⋀⋀, or ◇ -shaped; no incisors nor molars.

e^1. LUTIANINÆ. Interorbital area not flat, the frontal region invaded by the occipital and temporal crests which extend forward about to the eye; jaws with canine teeth; dorsal fin continuous.

f^1. Soft dorsal and anal fins more or less scaly; last rays of dorsal and anal not produced; pectoral falcate; tongue usually with teeth.

g^1. Fronto-occipital crest, not reaching near to front of frontal; caudal fin lunate; gill rakers few, rather short.....*Lutianus*, 4.

e^2. Interorbital area flat, separated by a transverse line of demarcation from the occipital, by which the median as well as the lateral crests are limited; frontals wide in front; tongue and pterygoids toothless; soft dorsal and anal scaleless (in Asiatic species); top of head naked; soft dorsal with 11 or 12 rays.

h^1. APRIONINÆ. Dorsal fin continuous; last ray of dorsal and anal more or less filamentous; jaws and front of head naked.

i^1. Jaws with well-developed teeth; teeth on vomer and palatines.

j^1. Pectoral fin long, falcate; body not fusiform, more or less compressed.....*Pristipomoides*, 5.

h^2. ETELINÆ. Dorsal fin deeply notched.

k^1. Cranium not cavernous; dorsal and anal naked; maxillary scaly; opercle without spine; caudal deeply and, in the adult, unequally forked.....*Etelis*, 6.

e^2. Vomer and palatines without teeth.

l^1. APHAREINÆ. Pectoral fin falcate, its lower rays also prolonged in the adult; dorsal and anal scaleless, the last rays produced; jaws with very small teeth which disappear with age; jaws heavy, the lower projecting. *Aphareus*, 7.

2. Genus GLAUCOSOMA Temminck and Schlegel.

Glaucosoma TEMMINCK and SCHLEGEL, Fauna Japonica, Poiss., 1843, p. 62.

Body robust, compressed, covered with rather small, weakly ctenoid scales; lateral line nearly straight, extending on the caudal fin; head large, almost everywhere scaly; maxillary and mandible scaly; mouth large, the lower jaw projecting; maxillary very broad, with a narrow, supplemental bone, hardly slipping under preorbital; teeth in narrow bands, some of them canine-like; teeth on vomer and tongue, apparently none on palatines; preopercle with blunt teeth at the angle; gill rakers long and slender. Dorsal fin small, of 8 graduated spines and 12 soft rays, much higher than spines; bases of dorsal and anal scaly; anal with three short graduated spines; caudal lunate, with blunt lobes; pectoral short, blunt; ventrals inserted below them.

Large fishes of the Pacific, of doubtful relationship. They should probably be referred to the *Serranidæ* rather than to the Lutianidæ. (*υλαυκβς*, sea-blue; *σώμα*, body.)

2. GLAUCOSOMA BURGERI Richardson.

Glaucosoma TEMMINCK and SCHLEGEL, Fauna Japonica, 1843, p. 62, pl. 67 (Nagasaki).

Glaucosoma burgeri RICHARDSON, Voy. *Erebus* and *Terror*, Fishes, 1846, p. 27 (after Temminck and Schlegel).—GÜNTHER, Cat. Fish Brit. Mus., vol. 1, 1859, p. 211 (in part only, description from *G. hebraicum*).—JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, 1903, p. 342, fig. 15 (Keerun, Formosa).—JORDAN and RICHARDSON, Mem. Carnegie Mus., vol. 4, 1910, no. 4, p. 185, fig. 13 (Takao, Formosa).

Habitat.—Formosa and southern Japan.

Description.—Of a specimen 17 inches long from Keerun, Formosa, after Jordan and Evermann.

Head $2\frac{3}{4}$ in body length; depth $2\frac{2}{5}$; eye $3\frac{1}{5}$ in head; snout $3\frac{4}{5}$; maxillary $1\frac{8}{5}$; mandible $1\frac{3}{5}$; interorbital space 5; preorbital width $7\frac{3}{10}$; D. VIII, 12; A. III, 10; scales 12–52–20.

Body rather short and deep, compressed; caudal peduncle compressed and deep, its least width 1.65 in eye, its least depth $2\frac{1}{2}$ in head; back gently and regularly arched from snout to caudal peduncle, somewhat depressed in front of eyes; head large and deep; eyes very large, rather high; nostrils close together, the posterior the larger; mouth very large, somewhat oblique, jaws subequal; maxillary very broad at tip, scarcely slipping under preorbital; teeth in a strong villiform band on upper jaw, composed of two rows, the outer in front canine-like; those of lower jaw in one series, except in front,

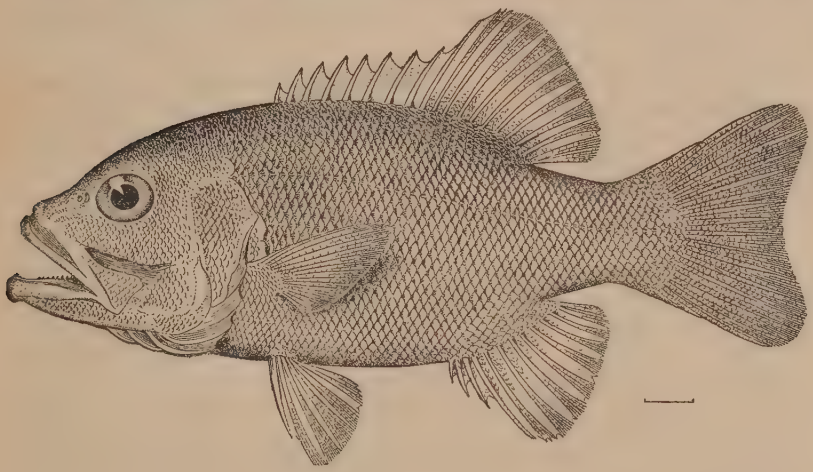

FIG. 1.—GLAUCOSOMA BURGERI.

where they are somewhat irregular; a large patch of villiform teeth on tongue and hyoid bone; a narrow V-shaped patch on vomer, apparently none on palatines. Angle of preopercle with coarse blunt teeth.

Fins moderate; dorsal spines rather short but strong, the soft part of dorsal somewhat elevated; longest dorsal spine $3\frac{1}{2}$ in head, longest ray $1\frac{9}{10}$; anal similar to soft dorsal, third spine considerably longest, 4 in head, longest ray 2; pectoral short and broad, $1\frac{2}{10}$ in head; ventrals scarcely reaching vent, 2 in head; caudal moderate, slightly lunate, the lobes rounded.

Scales moderate, weakly ctenoid, covering entire head, body, and bases of dorsal, caudal, and anal; maxillary densely scaled; base of pectoral scaled.

Color in alcohol, rusty silvery; head darker, somewhat purplish; edges of scales on side darkish, the bases brassy; dorsal, anal, and

caudal dusky; pectoral and ventral pale; a large brownish blotch on membrane below preorbital. Inside of mouth and peritoneum black.

This species seems to differ from *Glaucosoma hebraicum* Richardson, of Australia, in the absence of the elongation of the first soft rays of the dorsal, and in having 12 rows of scales above the lateral line, not 10. The absence of the palatine teeth needs confirmation, as these teeth may be deciduous. Doctor Günther remarks that Richardson's specimens of *Glaucosoma hebraicum* did not show the dorsal rays nearly as elongate as in his figure. A comparison of specimens, however, would be necessary before the characters separating the two species can be positively determined. The elongation of the dorsal rays is perhaps a character of age. The widely separated habitat of the Japanese species tends to render it probable that the Australian fish is different.

This species is probably rare in Japan. We have seen no specimen except the one described by Jordan and Evermann from Formosa.

(Named for Doctor Bürger, an artist naturalist, who made collections about Nagasaki for Siebold and Schlegel.)

3. Genus DODERLEINIA Steindachner.

Doderleinia STEINDACHNER, Fische Japans, I, Akad. Wiss. Wien, vol. 47, 1883, p. 129 (*orientalis*=young).

Acanthocephalus DODERLEIN, Ms. in Fische Japans, I, 1883, p. 129 (*orientalis;* name preoccupied).

Eteliscus JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 355 (*berycoides;* based on an error of Steindachner).

Corusculus JORDAN and SNYDER, Check List Fish. Ann. Zool. Jap. vol. 3, pts. 2 and 3, 1901, p. 75 (*berycoides*).

Body oblong, compressed, covered with large, firm scales; head scaly, except on snout; both jaws scaly; mouth large, oblique, the lower jaw projecting; maxillary broad, with a broad supplemental bone; teeth strong, some of them canine-like; teeth on vomer and palatines, none on tongue; preorbital very narrow, not sheathing the maxillary; preopercle finely serrate; supraoccipital crest scarcely encroaching on cranium, not extending to orbit; opercle ending in two spines. Dorsal fin short, deeply notched, of 9 spines and 10 soft rays; a few scales at base of soft dorsal; fourth spine highest; anal fin short, with three small, graduated spines; last rays of dorsal and anal not prolonged; pectorals long, but not falcate, the tip obtuse; ventrals below pectorals; caudal lunate.

Coasts of Japan. In spite of its resemblance to *Etelis*, the affinities of this genus seem rather with the *Anthiinæ*, as indicated by Hilgendorf. It should doubtless be transferred to the Serranidæ, where it should form a distinct subfamily.

(Named for Prof. Ludwig Doderlein, who collected fishes in Japan for the Museum of Vienna.)

3. DODERLEINIA BERYCOIDES (Hilgendorf).

AKAMUTSU (Red Mutsu[a]).

Anthias berycoides HILGENDORF, Sitzungsb. Ges. Naturf. Freunde, Berlin, 1879, p. 78 (Japan).

Etelis berycoides STEINDACHNER and DODERLEIN, Fische Japans, I, Akad. Wiss. Wien, vol. 47, 1883, p. 15, pl. 4; p. 91 (Tokyo).—ISHIKAWA, Prel. Cat., 1897, p. 57 (Kadzan).

Eteliscus berycoides JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 355 (Tokyo); Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 77 (after Steindachner).

Corusculus berycoides JORDAN and SNYDER, Check List, Ann. Zool, Jap., vol. 3, pts. 2 and 3, 1901, p. 75 (after Hilgendorf).

Doderleinia orientalis STEINDACHNER and DODERLEIN, Fische Japans, I, Acad. Wiss. Wien, vol. 47, 1883, p. 29 (Tokyo).

Acanthocephalus orientalis DODERLEIN, Ms. in Steindachner and Doderlein, Fische Japans, I, Acad. Wiss. Wien., vol. 47, 1883, p. 29 (Tokyo).

Habitat.—Deep waters off Tokyo.

Description.—Of a specimen 335 mm. in total length from off Tokyo, probably from Awa.

Interorbital space 5 in head; suborbital 7 in eye; D. VIII, I, 10; A. III, 8; scales in longitudinal series, above lateral line, 50, below 40, in transverse series from dorsal to anal 4/14; vertebræ 25 (Hilgendorf).

Body shaped much as in *Etelis*, fusiform, symmetrical, head conical, as wide as body, 2 in body depth; caudal peduncle rather deep, 3 in head. Profile of head continuous with that of body. Eyes large, circular. Snout shorter, $1\frac{1}{3}$ in eye, its tip at level of lower margin of pupil. Suborbital very narrow. Lower jaw projecting, its tip continuing profile of snout. Maxillary 2 in head, ending under posterior border of eye, its distal width one-half of eye, and sheathed but slightly by preorbitals. Premaxillaries produced to either side of tip of snout, leaving a deep emargination, into which fits a large symphyseal knob or production of the tip of mandible. Lower jaw contained in upper on sides. Teeth on vomer and palatines in a single row, stout, villiform, on vomer in an inverted V-shape; on premaxillaries in outer row small; outwardly projecting, stout canines anteriorly, becoming gradually smaller posteriorly, finally indistinguishable from inner villiform band, the latter extending along whole of premaxillaries, deepest at middle of extent, forming a low triangle; on inner edge of tip of premaxillaries a group of four to six strong canines, directed posteriorly; on mandible a loose row of stout canines, longest on the arched central portion of each mandible, but not much larger than those of anterior end of premaxillaries. Tongue toothless. Gill rakers as long as diameter of pupil, 8+15. Preopercle with rather widely set, flexible, indistinct radiating points, leaving

[a] *Mutsu* is the Japanese name of *Scombrops boops*.

its margin slightly sinuate rather than dentate, but with one or two firm, spinous teeth of small size. Opercle with two sharp, spinous points, the upper smallest.

Dorsals deeply divided, but not separated; spines rather weak, fourth highest, $2\frac{3}{4}$ in head, the others graduated, the eighth $8\frac{1}{2}$ in head, last 4; base of spinous dorsal $3\frac{2}{3}$ in body; dorsal rays equal in length, $2\frac{1}{2}$ in head, soft dorsal base $5\frac{1}{2}$ in body; anal spines graduated, slender, last $3\frac{1}{2}$ in head; first and second rays longest, $2\frac{2}{3}$ in head, last $4\frac{1}{4}$. Pectorals not falcate, fourth to seventh nearly of equal length, the tip barely reaching anus, length $3\frac{1}{2}$ in body. Ventrals inserted almost directly beneath pectoral base, short, extending one-half way to anus. Caudal only slightly emarginate.

Lateral line parallel with dorsal profile of body, its tubes large, broad.

Scales on body parallel to lateral line above it, and to body axis below, those on body large and thin, finely ctenoid. Top of head posterior to center of eyes and temporal region thickly covered with very small scales. Preorbital below eyes, maxillary, cheeks and mandible scaled; scales on opercle largest, and those on mandible similar to those on dorsal surface of head. Bases of dorsals, anals, and ventrals scaleless. Pectorals with few scales only. Caudal scaled on basal half.

Color in life bright crimson. Color of an old alcoholic specimen uniform yellowish brown, bases of scales showing deeper. Slight margining of black on dorsals and caudal. Gill cavity, mouth, and peritoneum black.

This species is known from the deeper waters about Tokyo. Of our specimens, the largest, described above, is $33\frac{1}{2}$ cm. in length.

The species was first named *Anthias berycoides* by Hilgendorf, and afterwards described and very well figured as *Etelis berycoides* by Steindachner.

Later a young example was made the type of a genus, *Doderleinia*, by Steindachner. This specimen was $5\frac{1}{2}$ cm. in length. As usual with young fish of this type, the preopercle was more strongly serrate than in the adult, and the head appeared to be perhaps scaleless. Steindachner speaks of the second anal spine as "kaum länger als der dritte." In our specimen the second is two-thirds the length of the third. *Doderleinia orientalis* differs in no other way from the young of *Anthias berycoides*.

The species has been unfortunate in its generic denominations. The name *Doderleinia*, given to the young, has clear priority over the later names. *Acanthocephalus*, suggested by Doderlein, is preoccupied. The name *Eteliscus* was given by Jordan and Snyder, on account of the fin formula (D. XIV, I, 10), erroneously given by Steindachner to his *Etelis berycoides*. This formula is clearly a slip

in copying. Later the same writers gave the name *Corusculus* to the *berycoides* of Hilgendorf, which is the same species. The name *Doderleinia berycoides* replaces all others for this beautiful and interesting fish, which seems to be midway between *Anthias* and *Etelis*.

(βέρυξ, beryx; εἶδος, resemblance.)

4. Genus LUTIANUS Bloch.

Lutianus BLOCH, Ichthyologia, vol. 4, 1790, p. 107 (*lutianus*); the name first spelled *Lutianus*, but later changed, on the plates and elsewhere, to *Lutjanus*.

Diacope CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 2, 1828, p. 410 (*sebæ*); name preoccupied in *Lepidoptera*.

Mesoprion CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 2, 1828, p. 441 (*lutianus*, etc.).

Genyoroge CANTOR, Cat. Malay. Fishes, 1850, p. 12 (*sebæ*); substitute for *Diacope*.

Evoplites GILL, Proc. Acad. Nat. Sci. Phila., 1862, p. 236 (*pomacanthus*=young of *kasmira*).

Neomænis GIRARD, U. S. Mex. Bound. Survey, Zool., Fishes, 1859, p. 18 (*emarginatus*=*griseus*).

Hypoplites GILL, Proc. Acad. Nat. Sci. Phila., 1862, p. 236 (*retrospinis*).

Proamblys GILL, Proc. Acad. Nat. Sci. Phila., 1862, p. 236 (*nigra*=*macolor*).

Macolor BLEEKER, Poiss. Amboina, Ned. Tyd. Dierk., 1867, p. 277 (*macolor*).

Raizero JORDAN and FESLER, Rept. U. S. Fish Comm., 1889 (1893), p. 438 (*aratus*).

Body oblong, compressed, the back somewhat elevated; head long, naked or scaly above, with a broad oblique band of scales at the nape; nostrils normally close together, neither with a tube; mouth large, the jaws with bands of villiform teeth, besides which is usually an outer series of larger teeth in each jaw, and 2 to 4 stronger teeth or canines in front of upper jaw; vomer with villiform teeth; villiform teeth on the palatines; usually one or more patches of teeth on the tongue in the adult; no molar teeth; no teeth on pterygoids; preopercle without notch (*Lutianus*) or with a shallow or deep emargination (*Genyoroge; Evoplites*); posterior limb of preopercle finely serrate; gill rakers rather few, shortish; soft rays of dorsal and anal scaly at base; last rays of dorsal and anal not produced; dorsal spines 10 (rarely 11), continuous with the soft rays; anal rays 7 to 9. Interorbital area not flat nor separated from the occipital region, the median and lateral crests procurrent on it, and the frontal narrowed forward; fronto-occipital crest ceasing anteriorly far from front of frontal, usually behind eye; prefrontal with posterior areas impressed, long, and cribriform; prefrontal with the articular facets arising from diverging V-shaped ridges; basisphenoid with an anterior lobiform extension. Vertebræ 10+14=24.

In the old-world species of this genus, the fronto-occipital crest generally coalesces with the orbital rim, while in American forms (*Neomænis* Girard) the two are separate. We doubt, however, whether the latter group can be maintained as a distinct genus.

This genus is a very large one, showing much variation in form, dentition and scaling. At present we do not venture to subdivide it.

Species very numerous, chiefly of the East Indies and West Indies, active, predatory fishes, highly valued as food.

(Name from Ikan Lutjang, the Malay name of *Lutianus lutianus*.)

a^1. EVOPLITES.—Top of head scaly; notch in preopercle deep.
  b^1. Sides with about 4 narrow sharply defined blue stripes; D. X, 15; A. III, 8; scales about 9–75–20; scales above lateral line in series not parallel with the lateral line ..... *kasmira*, 4.
a^2. LUTIANUS.—Top of head naked; notch in preopercle shallow.
  c^1. Vomerine teeth in a ⋀-shaped patch, with a posterior shaft; teeth on tongue in adults; a black bar or blotch on sides, young usually with 3 or 4 black longitudinal stripes; scales above lateral line in series not parallel with lateral line.
    d^1. Sides with a broad black stripe from eye to middle of caudal, somewhat interrupted and widened below soft dorsal; scales 7–60–15 ..... *vitta*, 5.
    d^2. Sides with a large black blotch below first rays of soft dorsal, its largest part above lateral line; no broad lateral stripe; young with 3 or 4 black lengthwise streaks. Scales 8–50–16 ..... *russelli*, 6.
  c^2. Vomerine teeth in a ⋀-shaped patch, without backward shaft; tongue toothless; no black lateral stripe or lateral blotch; scales about 50.
    e^1. Caudal peduncle with a black saddle-like blotch at its base, bordered anteriorly and posteriorly by lighter spots; third anal spine not shorter than second. Scales about 11–50–20 ..... *erythropterus*, 7.
    e^2. Caudal peduncle without black saddle; third anal spine shorter than second; scales larger.
      f^1. Head in adult with blue sinuous lines; young with dark bars; usually a milk-white blotch on lateral line below first dorsal rays. Scales 9–50–18 ..... *rivulatus*, 8.
      f^2. Head without blue or dark stripes; fins narrowly margined with yellow, with black submarginal shades; no white blotch. Scales about 7–50–16 ..... *vaigiensis*, 9.

4. LUTIANUS KASMIRA (Forskål.)

Sciæna kasmira FORSKÅL, Descr. Anim., 1775, p. 46 (Red Sea).

Mesoprion kasmira KLUNZINGER, Fische Rothen Meeres, 1884, p. 12, in part (Red Sea).

Lutianus kasmira DAY, Fishes India, 1888, p. 783 (India).—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 76.

Evoplites kasmira JORDAN and EVERMANN, Fishes North and Middle America, vol. 2, 1898, p. 1246 (Swatow, China).

Holocentrus quinquelineatus (or *quinquelinearis*) BLOCH, Ichthyologia, 1790, pl. 239 (Japan) (not *Lutianus quinquelineatus* of most subsequent authors).

Holocentrus bengalensis BLOCH, Ichthyologia, 1790, pl. 246, fig. 2 (Bengal).

Genyoroge bengalensis GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 178, in part (Red Sea, India, Île de France, Amboyna, Fiji, Louisiades: China).

Lutianus bengalensis BLEEKER, Nat. Verh. Kon. Akad., vol. 13, Revision Lutjani, 1873, p. 34 (Sumatra, Java, Celebes, Timor, Ternate, Halmahera, Batjan, Buro, Ceram, Amboyna, Waigiu).—DAY, Fishes India, p. 33, 1875, pl. 10, fig. 4.—BLEEKER, Atlas Ichth., vol. 8, 1876, p. 55, pl. 333.—STEINDACHNER and DODERLEIN, Fische Japans I, Akad. Wiss. Wien., vol. 47, 1883, p. 28 (Kagoshima), and of various authors.

Perca polyzonias (Forster), BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 316 (South Seas).

Diacope octolineata RÜPPELL, Reise Nord. Afrika, Atlas, 1826, p. 75 (Red Sea).—CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 2, 1828, p. 418 (Red Sea, etc.) in part.—TEMMINCK and SCHLEGEL, Fauna Japonica., 1843, p. 12, pl. 6, fig. 2 (Nagasaki) and of various authors.

Genyoroge octovittata GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 180 (Île de France).

Mesoprion etaape LESSON, Voyage *Coquille*, 1830, p. 229 (Matavia, Beula; from Tahiti to Borabora).

Mesoprion pomacanthus BLEEKER, Nat. Tyd. Ned. Ind., vol. 6, 1855, p. 407 (Amboina).

Evoplites pomacanthus GILL, Proc. Acad. Nat. Sci. Phila., 1862, p. 234, name only.

Habitat.—East Indies and neighboring seas, north to Nagasaki, and Kagoshima in southern Japan.

Description.—Of a specimen 180 mm. in total length, from Fuga Island, Philippine Archipelago.

Head $2\frac{2}{3}$ in length to base of caudal, $3\frac{2}{5}$ in total; depth equal to head; maxillary $2\frac{1}{2}$ in head; longitudinal diameter of eye 4; width of preorbitals 6; snout 3; D. X, 15; A. III, 8; scales above lateral line in longitudinal series (counting transverse rows) 78; below 66; between lateral line and dorsal 9; between lateral line and anal 20.

Dorsal and ventral profiles evenly arched, save for the straight dorsal profile of head. Upper jaw slightly longer, the lower included; maxillary ending below anterior half of eye; teeth in outer rows of both jaws conical, with two canines of larger size placed anteriorly in the upper, remainder small; in lower jaw those of outer row largest posteriorly, but much smaller than canines of upper. Inner bands in both jaws of minute, bristle-like teeth, absent posteriorly in the lower. Teeth on vomer in a /\-shaped band; on palatines in narrow bands; teeth absent on tongue; preopercle with a prominent angular notch on its posterior margin, which is finely toothed above and coarsely below and on the rounded angle. Interopercle with large, bluntly-spinous knob, fitting into preopercular notch. Opercle ending in two flat points.

Fourth dorsal spine highest, $2\frac{3}{4}$ in head, remainder diminishing gradually in length, the last shorter than penultimate; second anal spine much longer than third, $2\frac{1}{2}$ in head, the third 3. Soft dorsal height one-half its length. Pectorals long, reaching a trifle beyond anus, $1\frac{1}{4}$ in head. Ventrals short, not reaching anus, $1\frac{7}{8}$ in head. Caudal slightly emarginate.

Scales ctenoid, present on basal half of soft dorsal and anal, and on outer rays of caudal nearly to their tips. Occiput behind center of eyes densly scaled, as is temporal region and cheeks behind center of eyes; interopercle, subopercle, and lower limb of preopercle scaled; scales on opercle 10 or 11 rows, on preopercle 7. Rows on body above lateral line oblique, those below horizontal.

Color in spirits yellowish brown; head dark on scaleless parts; four longitudinal stripes of bright blue bordered with black on body, their width one-fourth eye diameter; first extending from a point above eye to insertion of soft dorsal, second from upper margin of eye to center of soft dorsal, third from lower margin of eye to upper part of caudal, and fourth from snout to middle caudal rays; below fourth on head, an indistinct stripe, not extending on body, and an indistinct, diffuse blotch of dusky equal to eye present under first soft rays of dorsal.

This species, very common in the East Indian region, has been twice recorded from southern Japan, although no specimens were taken by Jordan and Snyder. As Bloch records from Japan his *quinquelineatus* or *quinquelinearis* (the latter name on the plate, the former on the description), it is not impossible that he had in hand the present species. The figure of *quinquelinearis* resembles *L. kasmira*, but Day has examined the type of Bloch's description, which he finds identical with *Lutianus cœrueolineatus* of Klunzinger. The species we have hitherto called *quinquelinearis* is widely different from *Lutianus kasmira*.

(*kasmira*, an Arabic name.)

5. LUTIANUS VITTA (Quoy and Gaimard).

KINSEIISAKI (new-fashioned Porgy); TARUMI.

Serranus vitta QUOY and GAIMARD, Voy. *Uranie*, vol. 2, 1824, p. 315, pl. 58, fig. 3 (Waigiu).—RICHARDSON, Ichth. China, 1846, p. 234 (Hongkong).—CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 2, 1828, p. 239, and vol. 6, 1830, p. 505 (after Quoy and Gaimard).

Diacope vitta TEMMINCK and SCHLEGEL, Fauna Japonica, 1843, p. 13, pl. 6, fig. 4, (Nagasaki).

Mesoprion vitta BLEEKER, Verh. Bat. Gen. Kunst. Wet., vol. 22, 1849, p. 44 (Batavia); Not. Ichth. Ternate, Ned. Tyd. Dierk., 1863, p. 233 (Ternate); Verh. Kon. Akad. Wet., XIII, Révision Lutjani, 1873, p. 25.—KNER, Reise *Novara*, 1860, p. 37 (Java).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 207 (Hongkong, Amboyna, Molucca, Louisades, Port Essington).

Lutjanus vitta DAY, Fishes India, 1875, p. 46, pl. 14, fig. 2.—BLEEKER, Atlas Ichth., vol. 8, 1876, p. 51, pl. 60, fig. 3 (Sumatra, Singapore, Bangka, Biliton, Java, Bali, Celebes, Ternate, Amboyna, Ceram, Waigiu, Bawak, New Guinea).—STEINDACHNER and DODERLEIN, Fische Japans, Akad. Wiss. Wien, vol. 47, 1883, p. 28 (Tokyo).

Lutianus vitta JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 76.

Mesoprion phaiotæniatus BLEEKER, Verh. Bat. Gen. Kunst. Wet., vol. 22, Perc., 1849, p. 43 (Batavia).—ISHIKAWA, Prel. Cat., 1897, p. 56 (Tokyo).

Mesoprion ophuyseni BLEEKER, Act. Soc. Scient. Ind. Neerl., vol. 8, Achste Bijdt. Vischf., *Sumatra*, 1859, p. 74 (Sumatra).

Habitat.—East Indies, common northward to Tokyo, in southern Japan.

Description.—Of numerous specimens from Wakanoura, Nagasaki, and Kobe, from 135 to 260 mm. in length.

Head $2\frac{5}{6}$ in length, $3\frac{1}{2}$ with caudal; depth of body equal to length of head; maxillary $2\frac{1}{4}$ in head; eye 4; interorbital space $4\frac{1}{3}$; suborbital width 6; snout 3; D. X, 13; A. III, 8; scales 53 in lateral line to base of caudal, 70 above, counting transverse rows, 56 counting oblique series, and 55 to 60 below in longitudinal series, 7 or 8 between dorsal and lateral line, 16 between lateral line and ventrals; 6 or 7 series on preopercle, 8 or 9 on opercle. Gill-rakers, 4 rudiments and 1 fully developed on upper limb of arch; 4 rudiments and 9 fully developed on lower; longest one-third diameter of eye. Branchiostegals 7.

Dorsal and ventral body profiles similar, the outline straight over eyes. Caudal peduncle depth $2\frac{2}{3}$, length from last anal rays $1\frac{5}{6}$ in head. Snout long, $1\frac{1}{2}$ times eye, pointed and conical, its tip at level of lower border of eye. Jaws subequal; maxillary ending slightly before center of eye, cleft of mouth rather oblique. Teeth in both

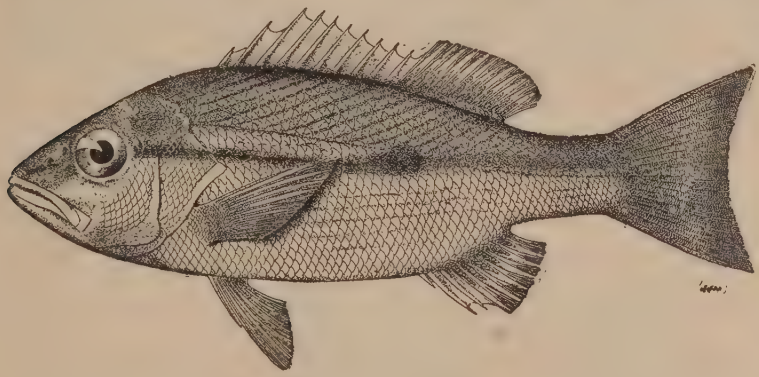

FIG. 2.—LUTIANUS VITTA.

jaws with larger external row, above with moderately large canine at either side, laterally much smaller conical teeth, below small anteriorly with canines on either side at middle of dentary; inner teeth in both jaws narrow, bristle-like bands, lacking posteriorly below; teeth on vomer in triangular patch with posteriorly projecting shaft; on palatines and tongue bands of similar, villiform teeth.

Preopercular margin notched, with slight knob on interopercle fitting into it, below more coarsely serrated than above. Opercle with two points, lower longer, upper short, triangular, rather stiff and pointed.

Dorsal spines longest in fourth and fifth, which are contained $2\frac{2}{3}$ in head. Longest dorsal rays $3\frac{1}{4}$ in head, fin margin rounded; second anal spine equal to or rather longer than third, the former contained $3\frac{1}{2}$ in head. Longest anal ray contained $2\frac{1}{2}$ in head. Pectorals and ventrals pointed, the former falcate, not reaching anus, contained $1\frac{1}{2}$ in head; latter $1\frac{2}{3}$ in head.

Scales ctenoid, present on posterior part of occiput and temporal region in continuation with those on posterior part of cheeks; interopercle and opercle scaled; snout, jaws, and interorbital space naked. Soft dorsal and anal scaled on basal two-fifths, caudal on basal half. Rows of scales above lateral line oblique, below horizontal.

Color in spirits darker above, silvery below, more or less red in life; a black lateral stripe running horizontally from snout to upper rays of caudal, less distinct before eyes and posterior to anus; below soft dorsal this stripe is widened to a diffuse blotch. No axillary blotch, a narrow streak following each row of scales, above level of pectoral, oblique above lateral line, and horizontal below. Fins colorless, dorsals and caudal darker than others. Peritoneum and lining of gill cavities pale.

This species is common in the markets of southern Japan. It was seen at Onomichi, Kawatana, Hakata, Kobe, Wakanoura, and Nagasaki, as well as at Tokyo and Misaki. It is known locally as Kinseiisaki, modern Isaki or porgy (as distinguished from the ancient or old-fashioned Koshiisaki, *Lutianus russelli*). Isaki is the name of the common *Parapristipoma trilineatum*. This species is also locally called *Tarumi*.

(*vitta*, stripe.)

6. LUTIANUS RUSSELLI Bleeker.

KOSHIISAKI (Ancient Porgy).

Lutjanus russelli BLEEKER, Verh. Bat. Gen. Kunst. Wet., vol. 22, Perc., 1849, p. 41 (Batavia).

Lutjanus notatus BLEEKER, Not. Ichth. Ternate, Ned. Tyd. Dierk., vol. 1, 1863, p. 233 (not of Cuvier and Valenciennes).

Lutianus russelli JORDAN and SEALE, Bull. U. S. Bur. Fish., vol. 26, 1906, p. 20 (Cavite, P. I.).

Lutjanus fulviflamma DAY, Fishes India, 1875, p. 41, pl. 12, fig. 5 (in part); (as var. *russelli*); Fishes India, Supplement, 1888, p. 783.—JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, 1903, p. 343 (Keerun, Formosa); (not *Sciæna fulviflamma* of Forskål).

Mesoprion johnii ISHIKAWA, Prel. Cat., 1897, p. 56 (Kagoshima) (not of Bloch).

Lutianus quinquelineatus JORDAN and RICHARDSON, Bull. U. S. Bur. Fish., vol. 27, 1907, p. 258 (Manila, not of Bloch).

Lutianus fuscescens JORDAN and RICHARDSON, Mem. Carnegie Mus., vol. 4, 1910. no. 4, p. 184 (Takao, Formosa) (not of Cuvier and Valenciennes).

Lutianus nishikawæ SMITH and POPE, Proc. U. S. Nat. Mus., vol. 31, 1907, p. 474 (Hamashima).

Habitat.—East Indies, north to China and Japan. We have specimens from Kagoshima, Wakanoura, Tokyo, Misaki, Yokohama, and Shimezu (Suruga), Japan; Queensland, Australia; Cavite, Manila, and Puerta Princessa (Palawan); Philippine Islands; Takao and Keerun, Formosa; and from China, probably Shanghai.

Description.—Of adults and young, from 70 to 220 mm. in length.

Head $2\frac{2}{3}$ to $2\frac{6}{7}$ in body length, $3\frac{1}{2}$ in total; depth equal to head; maxillary $2\frac{1}{4}$ to $2\frac{1}{2}$ in head; eye $3\frac{1}{2}$ to $4\frac{1}{2}$; interorbital space $4\frac{1}{2}$; width of interorbital 5 to 6; snout $2\frac{1}{2}$ to 3; D. X, 14 or 15; A, III, 8 or 9; scales above lateral line 58 to 63, below 48 to 52; in transverse series from front of dorsal to anal $\frac{8}{16}$ or $\frac{9}{17}$.

Body rather deep, dorsal profile evenly and well arched, that of head straight or slightly concave. Snout somewhat pointed, not convex, its tip below lower margin of eye. Jaws subequal; maxillary ending below anterior half of eye. Teeth in both jaws larger externally, one or two moderately large canines on either side of upper jaw anteriorly, the remainder smaller; in lower jaw largest midway on either side; inner rows on both jaws rather narrow bands of bristle-like teeth, present only anteriorly in lower jaw; teeth on vomer in a rather anchor-shaped patch, on tongue in an oblong patch, on pala-

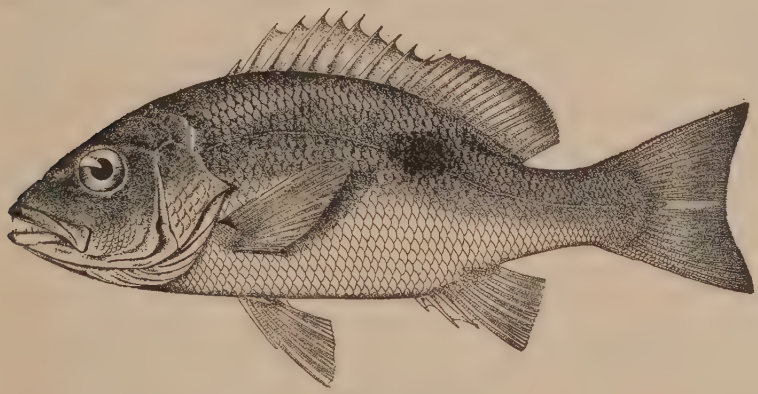

FIG. 3.—LUTIANUS RUSSELLI.

tines in narrow bands. Preopercular margin with moderately deep notch, its border finely serrated above, more coarsely below and on lower edge; interopercle with only indistinct prominence in the opercular notch.

Third and fourth dorsal spines longest, contained $2\frac{3}{4}$ in head, fifth only slightly shorter, last two subequal. Base of spinous dorsal $1\frac{1}{6}$ in head. Soft dorsal rounded, its base $1\frac{2}{3}$ in head, its rays not as long as dorsal spines. Pectorals $1\frac{1}{2}$ in head, not reaching anal. Ventrals acute, not reaching anus, half length of head. Anal spines strong, nearly equal in length, $3\frac{1}{2}$ in head; anal rays $1\frac{1}{3}$ times length of dorsal rays. Caudal slightly emarginate.

Scales less ctenoid on head than on body. Occiput scaleless posteriorly; temporal bands distinct, not connected with lateral, in 2 or 3 rows of about 10 each. Preopercle with 7 or 8 rows of scales, its lower limb scaleless; opercle with 6 or 7; interopercle with 1 or 2;

preorbitals scaleless. Soft dorsal and anal scaled on basal third, caudal nearly to tip on outer rays. Rows of scales above lateral line on body oblique, those below horizontal.

Body in spirits uniformly colored, olivaceous, lighter below; a large black blotch, its largest part above lateral line, below anterior part of soft dorsal, extending over eight scales longitudinally, and three or four transversely; around this an indistinct ocellation of lighter color. On axil of pectoral a small black spot. In young, four lateral longitudinal black stripes; first indistinct, near dorsal median line, ending at first dorsal spines; second distinct, from snout to middle of soft dorsal; third and fourth equally distinct, as broad as pupil and nearly twice as broad as second; third beginning at eye, passing through lateral blotch, and ending on upper half of base of caudal; fourth from below eye extending to lower half of base of caudal. These disappear with age, as shown conclusively by our series of specimens, and in adults are not to be seen. Color in life olive gray above, sides coppery red, axillary and lateral spots black; lower fins bright yellow, upper dark, tinged with red; upper scales with pearly spots. "Six or seven golden yellow streaks on body, upper four beginning at the orbit, first ending below dorsal spines, the rest below the dorsal rays, fifth from below the eye to the caudal, sixth and seventh from the maxillary to the caudal. These fading in spirits" (Bleeker).

Our young specimens are in all respects like those described by Smith and Pope as *Lutianus nishikawæ*, and these are undoubtedly the young of *L. russelli*. A careful comparison of measurements in hundredths of body length and of counts, as well as of shape and color, show no differences not due to age. The teeth on the tongue are apparently absent in very young specimens (of the size of the type of *L. nishikawæ*), but in slightly older specimens are barely distinct, as was noted by Bleeker.[a] The lateral stripes gradually disappear with age, as remarked above. This species is obviously not that which Day described and figured as *L. chrysotænia*, as is shown by the smaller scales above the lateral line, 75, not 52, as quoted. Our specimens show less than 64 in every case.

Lutianus russelli is apparently distinct from *L. fulviflamma*, as shown by our numerous specimens of the latter from the Philippine Islands, differing in having a more arched back in the adult, a greater number of scales in transverse series, lower dorsal spines ($2\frac{1}{4}$ to 3 in body depth, not 2 to $2\frac{1}{3}$), 7 rows of scales on preopercle instead of 6, smaller eyes, and a greater part of the lateral blotch above the lateral line.

The specimens (in Stanford University) identified as *L. fulviflamma* by Jordan and Evermann from Keerun, Formosa, are undoubtedly

[a] Atlas, vol. 8, p. 71.

L. russelli. The same is true of those identified as *L. fuscescens* by Jordan and Richardson from Takao, Formosa, and those identified by Jordan and Richardson as *L. quinquelineatus*, from Manila, Philippine Islands. That described as *L. russelli* by Jordan and Richardson from Cuyo, Philippine Islands,[a] is undoubtedly *L. fulviflamma*, the identification apparently being based on the yellow stripes present in life, but which are found in *L. fulviflamma*, more as in the description given.[b] All the above specimens are in Stanford University collections.

The specimen (cited by Day) in the British Museum from Amboyna as *Lutianus chrysotænia* is probably *L. russelli*, as it corresponds in most particulars with our young specimens.

Lutianus hoteen Richardson from Hongkong may be this species, in which case the name would have priority over *Lutianus russelli*. But it is more likely to be the same as *Lutianus fuscescens*, with which Günther, who has examined Richardson's specimens, has identified it.

This species is generally common in southern Japan and as far north as Tokyo, in company with *Lutianus vitta*.

(Named for Patrick Russell, the first student of the fishes of India.)

7. LUTIANUS ERYTHROPTERUS Bloch.

Lutianus erythropterus BLOCH, Ichthyologia, 1790, pl. 249 (Japan).—DAY, Fishes India, 1875, p. 32, pl. 10, figs. 1 and 2 (Japan, on Bloch's type; Red Sea; Pondicherry, on type of *Mesoprion rubellus* Cuvier and Valenciennes; not *L. erythropterus* of Bleeker).

Diacope sanguinea EHRENBERG in Cuvier and Valenciennes, Hist. Nat. Poiss., vol. 2, 1828, p. 437 (Massaua, Red Sea; types examined by Day).—BLEEKER, Verh. Bat. Gen. Kunst. Wet., vol. 22, Perc., 1849, p. 48 (East Indies).

Mesoprion rubellus CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 2, 1828, p. 475 (Pondicherry; types examined by Day).

Mesoprion annularis CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 2, 1828, p. 484 (Java); vol. 3, p. 497.—GÜNTHER, Cat. Fish Brit. Mus., vol. 1, 1859, p. 204 (China, Australia).—KNER, Reise *Novara*, 1860, p. 33 (Java, Singapore).—GÜNTHER and PLAYFAIR, Fishes Zanzibar, 1866, p. 17 (Mozambique).—KLUNZINGER, Australian Fishes, 1879, p. 342.

Diacope annularis QUOY and GAIMARD, Voy. *Astrolabe*, 1834, p. 666, pl. 5, fig. 4 (Straits of Sunda).—RÜPPELL, Reise Nord. Afrika Atlas, 1828, p. 74 (Massaua, in Red Sea); Neue Wirbel., 1835, p. 91, pl. 24, fig. 2 (Massaua).

Lutjanus annularis BLEEKER, Ned. Tyd. Dierk. I. Deux. Not. Ichth., 1863, p. 240 (East Indies).—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 76.

Mesoprion chirtah CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 2, 1828, p. 488 (India, after *Chirtah* of Russell, 1803, pl. 93).

Mesoprion chirtah DAY, Proc. Zool. Soc., 1868, p. 150; 1869, p. 297.

Lutjianus chirtah BLEEKER, Nat. Verh. Kon. Akad., XIII, Rèvision Lutjani, 1873, p. 42 (Sumatra, Nias, Pinang, Singapore, Buitang, Bangka, Biliton, Java, Madura, Bali, Celebes, Batjan, Obi-major, Amboyna).—BLEEKER, Atlas Ichth., vol. 8, p. 58, Perc., 1876, pl. 23, figs. 1 and 2 (localities as above).

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[a] Bull. U. S. Bur. Fish., vol. 27, 1907, p. 257.

[b] Bleeker's Atlas, pl. 344, fig. 3.

Lutjanus christat BLEEKER (=*Mesoprion annularis* Cuvier and Valenciennes), Énum. Espèces Poiss. du Japon, 1879, p. 7 (Nagasaki) (misprint for *chirtah*).

Diacope erythrinus RÜPPELL, Neue Wirbel. 1835, p. 92, pl. 23, fig. 3 (Abyssinia).

Mesoprion erythrinus GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 199 (Red Sea, after Rüppell).—PLAYFAIR, Proc. Zool. Soc., 1867, p. 849 (types examined by Day).

Diacope metallicus (Kuhl and van Hasselt) BLEEKER, Nat. Gen. Arch. Ned. Ind., vol. 2, 1845, p. 525 (Batavia).

Habitat.—East Indian seas, recorded by Bloch and by Bleeker, from southern Japan. Both records must be regarded as doubtful.

Description.—Of three specimens from Sumatra and three from Manila, P. I., from 84 to 105 mm. in length.

Head $2\frac{1}{2}$ to $2\frac{2}{3}$ in body length to last vertebra, $3\frac{1}{2}$ in total; body depth $2\frac{1}{3}$ to $2\frac{1}{2}$ in body length, 3 in total; maxillary $2\frac{2}{5}$ in head; eye $3\frac{1}{2}$ to 4 (5 or 6 in adult, Day); interorbital space (bone), 5; suborbital width 5; snout 3; D. XI, 14; A. III, 8; scales in longitudinal series above lateral line 70 (56 oblique rows); in longitudinal series below 63; in lateral line 54; in transverse series, dorsal to insertion to ventrals 12/24; gill rakers 7+13; pyloric cæca 5 or 6.

Body compressed, deep; dorsal profile somewhat more convex than ventral; a slight concavity above orbit. Caudal peduncle from last anal rays to last vertebra $2\frac{1}{3}$ in head, its depth $2\frac{1}{2}$ to $2\frac{1}{3}$. Jaws subequal; maxillary ending under front margin of orbit or slightly before; on premaxillary one or two canines on either side, the inner pair if present, smaller; on both jaws an outer row of larger teeth, smallest on lower jaw; inner teeth of both jaws villiform or bristle-like, in narrow bands; on vomer an inverted V-shaped patch of villiform teeth; on palatines narrow bands, none on tongue. Gill rakers moderate in length, one-half diameter of eye in young. Preoperculum with shallow notch, margin finely serrated above, more coarsely below, and on horizontal border. No interopercular knob present. Subopercle broader than usual, one-third diameter of eye (in young).

Dorsal spines of moderate length and strength, fourth and longest $2\frac{2}{5}$ in head, remainder slightly less; tenth, the penultimate, being $2\frac{1}{2}$ in head. Dorsal rays longest in sixth and seventh, which are 2 in head. Longest anal spine third, contained $2\frac{2}{3}$ in head, but weaker than second; longest anal ray 2 in head. Pectoral and ventral length $1\frac{2}{5}$ in head, former reaching to and latter past anus. Spinous dorsal base 3 in body length to last vertebra, soft dorsal base $4\frac{1}{2}$, anal base 6. Caudal slightly emarginate.

Scales ctenoid. Bases of soft dorsal and anal scaled to a third of their height, on caudal over basal half. Rows on body oblique above and horizontal below lateral line. Occiput scaleless in posterior part, save for temporal rows, which are in 1 or 2 series of about 7 scales each. On preopercle 6 rows, on opercle and subopercle 9 rows, the lowermost with 10 scales.

Color in spirits dark, with indistinct lines on rows of scales, a broad, dark stripe through eye from snout to insertion of dorsal, a black spot on either side of caudal peduncle, merging on its upper surface, and bordered anteriorly and posteriorly with a lighter band. Dorsals and anal dusky, ventrals black at tip, pectorals and caudal clear.

Day, who saw Bloch's types, said to be from Japan, and who possessed a large series of the species from India, observes that the soft portion of the dorsal is more angular in adults than in young, and that the color also changes. The following is the substance of his description of the color in life:[a] Color crimson, with orange reflections; a broad blackish band passes from eye to insertion of dorsal, sometimes slightly apparent along whole base of fin; eight to twelve narrow and nearly horizontal black lines exist below the lateral line and several more above it, some being the continuations of those which commence below the lateral line; a black band crosses over back of free portion of tail, having a white one before it, a narrow pink one posterior; pectoral flesh colored; ventral either black, or stained black in its outer half or two-thirds; dorsal dark gray, in some specimens with a nearly black base and black edge; caudal pink, with narrow black border; anal darkest anteriorly. In adults (12 inches) black lines disappear, and each row of scales has a golden line; a trace exists of band from eye to dorsal fin, while that over the free portion of tail is somewhat indistinct.

(ἐρυθρός, red; πτερόν, fin.)

8. LUTIANUS RIVULATUS (Cuvier and Valenciennes).

FUYEDAI (Flute-player Porgy).

Diacope rivulata CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 2, 1828, p. 414, pl. 38 (Coromandel, Pondicherry).—KLUNZINGER, Syn. Fische Rothen Meeres, Verh. Zool. Bot. Ges. Wien, vol. 2, 1870, p. 694 (Red Sea).—SAUVAGE, Poissons de Madagascar, 1891, p. 104 (Madagascar).

Genyoroge rivulata GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 182 (China, Amboyna, Red Sea).—GÜNTHER and PLAYFAIR, Fishes Zanzibar, 1866, p. 16 (Aden, Zanzibar).

Lutjanus rivulatus BLEEKER, Nat. Verh. Akad. Roy. Neer. Sci., XIII, Lutjani, 1873, p. 81.—BLEEKER, Atlas Ichth., vol. 8, 1877, p. 73, pl. 347, fig. 3 (Sumatra, Java, Bawean, Bali, Celebes, Timor, Batjan, Buro, Amboyna, Waigiu).—DAY, Fishes India, 1875, p. 37, pl. 11, fig. 4.—STEINDACHNER and DODERLEIN, Denkschr. Akad. Wiss. Wien, vol. 47, 1883, p. 28 (Japan).—JORDAN and RICHARDSON, Mem. Carnegie Museum, vol. 4, 1910, no. 4, p. 184 (Takao, Formosa).—JORDAN and SEALE, Bull. U. S. Bur. Fish., vol. 25, Fishes Samoa, 1905, p. 262 (Apia).

Mesoprion rivulatus KLUNZINGER, Fische Rothen Meeres, 1884, p. 12 (Red Sea).

Diacope cœruleopunctata CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 2, 1828, p. 424 (after Russell, Balee-maee, pl. 96).

Mesoprion cœruleopunctatus BLEEKER, Percoid, Nat. Tyd., Ned. Ind., vol. 2, 1851, p. 169 (Padang).

Genyoroge cœruleopunctata GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 182 (Coromandel, Padang, Sumatra).—DAY, Fishes Malabar, pp. 7, 9.

[a] Fishes of India, p. 32.

Lutjanus cœruleopunctatus BLEEKER, Ned. Tyd. Dierk, vol. 2, 1863, p. 278 (Amboyna).

Diacope alboguttata CUVIER and VALENCIENNES, Hist. Nat. Poiss, vol. 7, 1831, p. 445 (Malabar).

Mesoprion myriaster LIÉNARD, Nat. Hist. Soc. Mauritius, 1839, p. 32 (according to Day and Bleeker).

Habitat.—East Indian seas, said to range northward to Japan.

Description.—Of two small specimens 70 and 85 mm. long from Naha, Okinawa, Riu Kiu Islands; specimens from Padang, Sumatra, and from Pago Pago, Samoa, the latter largest, 26 cm. in length.

Head $2\frac{1}{2}$ to $2\frac{2}{3}$ in body length, 3 to $3\frac{1}{3}$ in total; depth $2\frac{1}{3}$ to $2\frac{4}{7}$ in body; eye $3\frac{1}{2}$ to $4\frac{2}{3}$; maxillary $2\frac{1}{4}$ to $2\frac{1}{3}$; interorbital space (bone) 5; suborbital width 4 to 6 (narrowest in young); snout $2\frac{1}{2}$ to 3; D. X, 15; A. III, 8; scales above lateral line 55 to 60; below 50; in lateral line 50; in transverse series from insertion of dorsal to lateral line 8 or 9, from lateral line to anal insertion 18 or 19.

Body deep, back strongly arched, especially in adults. Dorsal profile of head straight, greatest curve of back at occiput and nape. Snout not very pointed, its tip much below lower border of eye in adult, not in young. Jaws subequal, maxillary ending below anterior half of eye; small canines present on either side of premaxillaries; outer rows of both jaws enlarged, inner villiform bands; vomerine teeth in ⋀-shaped patch; tongue toothless; palatine teeth in narrow bands. Lips thick, papillate on inner side. Preopercle with moderate narrow notch, and interopercle with knob fitting into it. Margin of preopercle finely serrate above, more coarsely below, especially in young. Opercle with two points, the upper very short.

Dorsal spines strong, third longest, $2\frac{1}{2}$ in head. Spinous base 3 in body. Dorsal rays $2\frac{1}{3}$ in head; soft dorsal base $4\frac{1}{2}$ in body; its margin rounded or slightly pointed; anal spines stout, second longer than third, $2\frac{1}{6}$ in head; anal fin angulate; third ray longest 2 to 3 in head, reaching beyond last vertebra. Pectoral long, $1\frac{1}{5}$ in head, somewhat falcate. Ventrals pointed, reaching the anus, but with filaments which extend beyond. Caudal somewhat emarginate.

Scales above lateral line parallel to it as far back as fifth spine of dorsal, then oblique until last of soft dorsal. Rows below horizontal. Scales on opercle in 9 rows; on preopercle 6, in a broad band on its anterior edge, the posterior and lower limbs scaleless. Interopercle with 1 or 2 series. Temporal scales in 2 or 3 series, unconnected dorsally, larger than those on opercles. Soft dorsal and anal scaled on basal thirds, spinous dorsal with a shallow sheath at base, and a series running up anterior edge of each spine as far as on soft dorsal.

Color of young specimens in spirits rather dark, paler ventrally; dorsal surface of head crossed by six narrow dark transverse lines, not visible on sides of head and cheeks, as they later become when adult; on body a transverse bar of black, as wide as pupil, running through point of opercle, fading out below, and fainter dorsally on

line of back; three pairs of indistinct narrow lines equidistantly placed between anterior line and base of caudal peduncle, those of each pair separated by width of pupil, and anterior ones less indistinct than posterior, but all fading out on ventral surface; a diffuse short line at last rays of dorsal; on lateral line, beneath first dorsal rays, a black blotch, half size of eye, with a narrow milk-white spot immediately behind, and a continuation of the black spot posteriorly, the whole covering ten scales of a longitudinal series; ventrals black on distal halves, other fins dusky. Steindachner and Doderlein give the following description of the color of an adult specimen 42 cm. long: Color of back brownish green, clearer ventrally; head dark violet dorsally, a blue, sinuous stripe under the eye; on scales of upper part of body only a very few blue spots; under base of first dorsal ray a slender, milk-white spot with a light stripe of pale red immediately over the lateral line.

The changes which apparently take place between the young and adult are disappearance of the transverse stripes, appearance of the numerous sinuous narrow lines on the cheeks, and of the spots on the scales above the lateral line, which Steindachner's specimen showed only in a few places, as well as a change in contour of head and depth of opercular notch. The band of scales on the preopercle apparently is less broad in adults.

This species of the South Seas is rare in southern Japan. It was first recorded by Steindachner and Doderlein without definite locality. We have before us numerous young examples collected at Tanegashima, off the coast of Kiusiu, by Professor Snyder. According to Doctor Ishikawa, the fish is known as Fuyedai; fuye, a flute player, and tai, a porgy.

(*rivulatus*, with winding streaks like rivulets.)

9. LUTIANUS VAIGIENSIS (Quoy and Gaimard).

Diacope vaigiensis QUOY and GAIMARD, Voyage *Uranie*, 1824, p. 307 (Waigiou) (not *Mesoprion vaigiensis* Günther).

Diacope marginata CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 2, 1828, p. 425 (Pondicherry).—PETERS, Wieg. Arch., 1855, p. 238.

Mesoprion marginatus BLEEKER, Ichth. Amboyna, Tyd. Ned. Ind., vol. 5, 1852, p. 555.—KNER, *Novara* Fische, 1860, p. 31 (Tahiti, Sydney).—GÜNTHER, Fische Südsee, 1873, p. 13, pl. 14 (Polynesia).

Genyoroge marginata GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 181 (Ceylon, Amboyna, Louisades, Coast of Mozambique).

Lutjanus marginatus BLEEKER, Ichth. Halmaheira, Ned. Tydss. Dierk., vol. 1, 1863, p. 155; Nat. Verh. Acad. Roy. Neer. Sci., XIII, Revision Lutjani, 1873, p. 72; Atlas Ichth., vol. 8, 1876, p. 69 (Sumatra, Cocos, Java, Bali, Celebes, Sangi, Timor, Halmaheira, Ternate, Batjan, Obi-major, Buro, Ceram, Amboyna, Banda, Waigiou, New Guinea).—STEINDACHNER and DODERLEIN, Fische Japans, 1883, p. 28 (Kagoshima).

Lutianus marginatus JORDAN and SNYDER, Check-List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 76.—JORDAN and SEALE, Bull. U. S. Bur. Fish., vol. 25, 1905, p. 263 (Apia, Samoa).

Diacope calveti TEMMINCK and SCHLEGEL, Fauna Japonica, Poiss., 1843, p. 14 (Nagasaki, not of Quoy and Gaimard).

Mesoprion gaimardi BLEEKER, Act. Soc. Sci. Ind. Neerl., vol. 6, 1859, p. 23 (Waigiou).

Diacope xanthopus CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 3, 1829, p. 495 (Trinquemali).

Diacope axillaris CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 6, 1830, p. 532 (Indian Seas).

Mesoprion kagoshimæ Doderlein Ms. in STEINDACHNER and DODERLEIN, Fische Japans, 1883, p. 28 (Kagoshima).

Habitat.—East Indian Seas, north to Kagoshima in southern Japan.

Description.—Of a specimen 14 mm. in total length, from Okinawa, Riu Kiu Islands, with numerous specimens from Apia, Samoa, and one from Keerun, Formosa.

Head 2½ to 2¾ in body to last vertebra, 3⅓ to 4 in total, depth 2½ to 2¾ in body; maxillary 2⅓ to 2⅔ in head; longitudinal diameter of eye

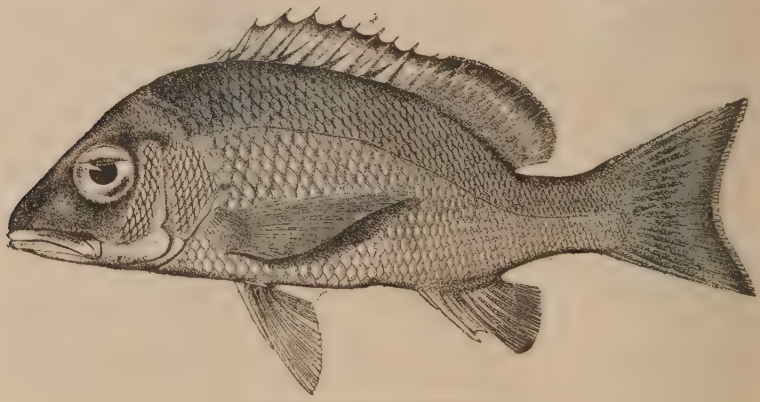

FIG. 4.—LUTIANUS VAIGIENSIS.

3½ to 4; interorbital space (bone) 5 or 6; width of preorbitals 5 to 5½; snout 2½ to 2¾ (1⅓ eye); D. X, 13 or 14; A. III, 8 or 9; scales above lateral line 58 to 65; below 49 or 50; in transverse series from insertion of dorsal to anal 8/15 or 16; pyloric cæca 7 (Kner).

Head somewhat conical; its dorsal profile straight or slightly convex. Jaws equal; maxillary ending below anterior half of eye or below pupil; tip of premaxillary below level of lower border of orbit. Teeth in both jaws larger externally, a small canine on either side of premaxillary, inner teeth in villiform bands, present anteriorly only in lower jaw. Vomerine teeth in a ⋀-shaped patch; palatine bands narrow; tongue without teeth; notch on preopercle moderately deep, with correspondingly strong knob on interopercle. Margin of preopercle finely serrated above, more coarsely and stronger below and on angle.

Dorsal spines strong, fourth longest, and contained 2½ to 2¾ in head; base of spinous dorsal 3⅓ in body length, soft dorsal base 4½ or 5.

Second anal spine longest $2\frac{1}{2}$ or $2\frac{3}{4}$ in head, third 3 in head; margin of anal fin angulate, as is soft dorsal posteriorly to a less degree. Pectoral equal to head less one-third length of snout, not reaching past anal insertion. Ventrals extending to anus. Caudal emarginate.

Scales on body in oblique rows above lateral line, horizontal below, present on basal third of soft dorsal and anal. Dorsal surface of head scaleless, save for rather broad temporal bands, in four or five series, of which the posterior are very small, the anterior larger; temporal bands separated from lateral scales of head, but narrowly. Preopercle with 6 or 7 rows of scales, opercle with 8 or 9; limb of preopercle scaleless; interopercle with one or two rows; preorbitals scaleless.

Body in spirits dark, slightly paler below; dorsal and caudal very narrowly edged with yellowish white, with a submarginal band of black on dorsal; caudal nearly black, the margin pale; anal colored as is body; pectorals and ventrals colorless. The following is a translation of Bleeker's description of the life colors: The color of the body is reddish, paler below, each series of scales with a broad yellow or golden stripe, oblique above lateral line, horizontal below. Dorsal spines with a broad black or dusky margin. Margin of soft dorsal, anal and caudal yellow, with deep violet or black submarginal area, the remainder reddish. Day remarks that his specimens from the Malabar coast of India frequently have a black lateral blotch.

There seems to be no reason to doubt the pertinence of the name *vaigiensis* to this species. Quoy and Gaimard note the yellow fins with dark submarginal stripe, and the oblique streaks along the rows of scales of the body.

A stuffed skin from Nagasaki is recorded by Temminck and Schlegel, who identify it very doubtfully with *Diacope calveti* Cuvier and Valenciennes, which is *Lutianus timoriensis* of Quoy and Gaimard.

In all probability this specimen, which is compared with Quoy and Gaimard's rough figure, belonged to *Lutianus vaigiensis*, and *L. timoriensis* = *L. calveti* should be erased from the list of nominal species of Japan.

(*vaigiensis*, living about Waigiu.)

5. Genus PRISTIPOMOIDES Bleeker.

Chætopterus TEMMINCK and SCHLEGEL, Fauna Japonica, Poissons, 1843, p. 78 (not *Chætopterus* of Cuvier, 1830, a genus of worms).

Pristipomoides BLEEKER, Tyd. Ned. Ind., vol. 3, 1852, p. 574 (*typus*).

Platyinius GILL, Proc. Acad. Nat. Sci. Phila., 1863, p. 237 (*vorax*=*macrophthalmus*).

Bowersia JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 22 (for 1902), 1903, p. 183 (*violescens*).

Ulaula JORDAN and THOMPSON; new subgenus; type, *Bowersia ulaula* Jordan and Evermann; substitute for *Chætopterus*, preoccupied.

Body oblong or rather elongate, compressed, covered with moderate sized scales. Skull as in *Aprion* and *Etelis*, the occipital crest

sharply set off from the cranium, on which it does not encroach; cranium broad and flattish above; mouth moderate, with canine teeth, which may be fairly large, or may be very small. Teeth on vomer and palatines and sometimes on tongue. Dorsal fin continuous; last soft ray of dorsal and anal produced; no scales on dorsal and anal; caudal forked; pectoral falcate, not shorter than head, the lower rays not produced.

This genus, as here understood, lies very close to *Aprion*, which differs mainly in the subcylindrical body, larger teeth, and especially in the very short and broad pectoral fin, which is about half head. In *Pristipomoides* the species with the deeper body have the pectoral fins most elongate.

In the closely allied genus, *Rooseveltia*, the cranium is narrower and with thickened ridges. *Apsilus* and *Tropidinius* have the skull of *Lutianus*, with the fins of *Pristipomoides*, the occipital crest being extended on the frontal region. These genera must be considered as allies of *Lutianus* rather than of *Aprion*.

The species of *Pristipomoides* differ considerably among themselves, and the group may admit of further generic subdivision. Bleeker unites all of these nominal genera to *Aprion*.

The recognizable subgenera may be thus compared:

Pristipomoides: Canine teeth strong; body elongate; pectoral falcate, but relatively short; no teeth on tongue (approaching *Aprion*).

Platyinius: Canine teeth moderate or strong; body compressed, not elongate; pectoral falcate, very long; no teeth on tongue.

Bowersia: Canine teeth weak; body compressed, elongate; pectoral long and falcate; no teeth on tongue.

Ulaula = *Chætopterus*, name preoccupied): Canine teeth very weak; body compressed, elongate; pectoral falcate; tongue with a patch of teeth.

(*Pristipoma* = *Pomadasis*, a genus of *Hæmulidæ*: εἶδος, resemblance.)

a[1]. PLATYINIUS. Canine teeth rather strong, body compressed; pectoral long, falcate; no teeth on tongue;

b. Depth $2\frac{2}{10}$ in length; dorsal rays X, 11, anal III, 8; scales 10–50–15. . *sparus*, 10.

a[2]. ULAULA. Canine teeth feeble; body elongate, compressed; pectoral elongate; tongue with a patch of teeth;

c. Depth $3\frac{1}{2}$ in length; dorsal rays X, 11; A. III, 8; scales 8–70–14. . *sieboldii*, 11.

10. PRISTIPOMOIDES SPARUS (Temminck and Schlegel).

Diacope sparus TEMMINCK and SCHLEGEL, Fauna Japonica, Poissons, 1843, p. 14 (Nagasaki).

Mesoprion sparus GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 188 (after Temminck and Schlegel).

Lutianus sparus BLEEKER, Enum. Espèces Poiss. du Japon., Acad. Roy. Neer. Sci., vol. 18, 1879, p. 7.

Platyinius sparus JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, 1903, p. 344, fig. 16 (Formosa).

Habitat.—Known from Formosa and southern Japan.

Description (after Jordan and Evermann).—Of a specimen from Formosa.

Head 3; depth 2.9; eye 3.2; snout 3.5; maxillary 2.25; mandible 1.9; interorbital 4; preorbital 6.25; D. X, 11; A. III, 8; scales 10–50–15; gill rakers x+12.

Body rather short, deep and compressed; dorsal and ventral outlines gently arched, occipital region slightly depressed; head large; mouth large, somewhat oblique, the lower jaw slightly the longer; maxillary broad, slipping for its entire length under broad preorbital; eye large; nostrils very small; preopercle strongly serrate at angle, scarcely notched, with fine long cirri; preorbital not as broad as eye; two strong canine teeth in front of each jaw, besides smaller lateral

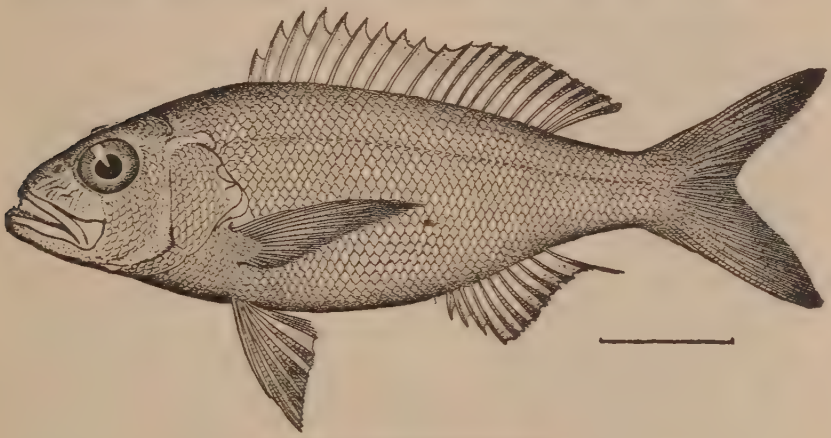

FIG. 5.—PRISTIPOMOIDES SPARUS.

canines; teeth on vomer in small V-shaped patch; no teeth on tongue. Gill rakers long.

Longest dorsal spine 2.75 in head, ray 2.75; last ray of dorsal and anal produced; pectoral length 1.25 in head; ventral 1.7; caudal deeply forked.

Scales small, nearly cycloid; cheek and opercle scaled, caudal fin scaled at base. No scales at base of dorsal or anal fins; bands of scales at the temples separated from those behind it; scales above lateral line in series parallel to it, six rows of scales on cheek.

Color, apparently bright red, now faded to silvery; cheeks bright silvery. This species is doubtless rare in Japan. We have seen no examples save this one from Formosa, now returned to the Imperial Fisheries School in Tokyo.

(*sparus*, a related genus, which this fish resembles.)

11. PRISTIPOMOIDES SIEBOLDII (Bleeker).

Chætopterus TEMMINCK and SCHLEGEL, Fauna Japonica, 1843, p. 78, pl. 37, fig. 2 (Nagasaki).

Chætopterus sieboldii BLEEKER, Nalez. Ich. Japan, 1857, p. 20, no. 146 (after Temminck and Schlegel).—REGAN, Ann. Mag. Nat. Hist., ser. 7, vol. 16, 1905, p. 18 (Inland Sea of Japan).

Aprion sieboldii BLEEKER, Enum. Espèces Poiss. du Japon, Acad. Roy. Neer. Sci., p. 7, 1879 (*Aprion sieboldii* Bleeker=*Chætopterus sieboldii* Bleeker).—JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, pts. 2 and 3, 1901, p. 76 (Nagasaki, after Temminck and Schlegel).

Chætopterus dubius GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 385 (after Temminck and Schlegel).—JORDAN and SNYDER, Bull. U. S. Bur. Fish., vol. 26, 1906, p. 213 (Honolulu, Fukaura, Japan).—JORDAN and SEALE, Bull. U. S. Bur. Fish., vol. 25, 1905, p. 269.

Aprion microdon STEINDACHNER, Ichth. Beitr., vol. 5, 1876, p. 158 (Hawaii).

Bowersia ulaula JORDAN and EVERMANN, Bull. U. S. Fish. Comm., vol. 23, 1903, p. 238, fig. 98 (Hilo, Hawaii).

Habitat.—Southern Japan; Hawaii.

This species is apparently rare in Japan. Jordan and Snyder obtained one example from Fukaura. This was compared carefully with the types of *Bowersia ulaula* from Hawaii, and no specific differences were noted.[a] This specimen from Fukaura has been mislaid, and at present we have only Hawaiian examples for comparison. These are cotypes of *Bowersia ulaula*.

Regan described a specimen from the Inland Sea of Japan, 230 mm. in length. The following is the substance of his account:

Head $3\frac{3}{5}$ in length; depth $2\frac{4}{5}$; eye $3\frac{1}{4}$ in head; interorbital width $2\frac{2}{3}$; snout shorter than eye; D. X, 10; A. III, 8; scales in longitudinal series 72, in transverse 8/19. Gill rakers x+20.

Body ovate, moderately compressed; mouth oblique; jaws equal anteriorly; maxillary exposed, without supplemental bone, extending to below anterior one-fourth of eye; width of its distal extremity two-fifths diameter of eye; premaxillaries protractile; preorbital narrow. Small villiform bands of teeth in jaws, vomer, and palatines; both jaws with a moderately enlarged outer series of teeth and with 2 or 3 moderate canines on each side anteriorly. Preopercle rounded and slightly produced at angle, with radiating ridges and crenulate margin; operculum with two spines. Pseudobranchiæ well developed; gill rakers as long as gill fringes.

Dorsal spines increasing in length to fourth, which is nearly one-half length of head, the last a little more than one-third length of head. Pectoral falcate, with 17 rays, longer than head, extending to above origin of anal. Ventrals commencing a little behind pectorals, extending to vent. Caudal deeply forked.

Lateral line concurrent with dorsal profile; scales lacking on interorbital region, snout, jaws, suborbitals, and preopercle; rest of head

[a] Bull. U. S. Bur. Fish., vol. 23, p. 213.

scaly. Cheek with six series of scales; dorsal and anal fins scaleless. Caudal covered with scales except near posterior margin. Scales finely denticulated.

This description differs from our Hawaiian specimens in the shorter, wider head, and especially in the larger number of scales below the lateral line. It is, however, in all probability the same fish. If, however, it is shown that these distinctions are permanent, the Hawaiian fish, described below, will stand as *Pristipomoides microdon*.

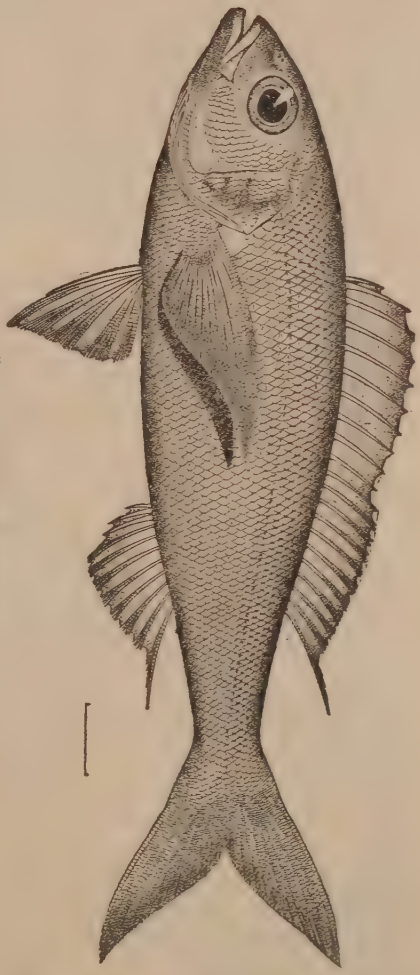

FIG. 6.—PRISTIPOMOIDES SIEBOLDII.

Description.—Of a specimen 360 mm. in length, from Honolulu, Hawaii, cotype of *Bowersia ulaula*.

Head $3\frac{1}{6}$ in body; depth $3\frac{1}{2}$ in length; eyes $3\frac{1}{2}$ in head; snout $3\frac{1}{2}$; maxillary 3; mandible $2\frac{1}{4}$; interorbital $3\frac{1}{2}$; preorbital 9; D. X, 11; A. III, 8; scales 8–70–16 (to middle line of belly 10+); gill rakers 20.

Dorsal outline of body a low, gentle curve, ventral similar. Head bluntly conic; interorbital space broad and only slightly convex; preorbitals very narrow, ending before anterior margin of pupil; jaws equal; maxillary ending under anterior margin of eye, slipping for most of its length under preorbitals. Preopercular margin serrate, more coarsely at margin, its angle slightly produced; opercle ending in two obscure flat spines. Teeth in villiform bands on jaws, vomer, palatines, and tongue, those in outer series of jaws scarcely enlarged. Gill rakers $2\frac{1}{2}$ in eye, rather stout.

Dorsal fin continuous; spines flexible, fourth longest, $2\frac{1}{2}$ in head; first half length of fourth; last $3\frac{1}{2}$ in head; dorsal rays little higher than spines, last half again as long as remainder; anal spines short,

weak, second slightly shorter than third, which is $4\frac{1}{3}$ in head; soft anal similar to soft dorsal, its last ray similarly produced. Pectoral long, equal to head, falcate; ventrals reaching half way to insertion of anal, $1\frac{4}{5}$ in head. Caudal deeply forked, lobes equal.

Scales ctenoid, rows parallel above and below lateral line; present on opercles in 13 rows, on cheek in 6 rows, limbs of preopercle naked, as is preorbital ring, and head, save for temporal bands, when the scales are in four series of five or six each. Dorsals and anal naked, caudal densely scaled.

Color of an old alcoholic specimen uniform silvery, purplish in life; dark purplish, paler below; each scale on sides and back with a central darker spot, forming indistinct lines; fins pale.

(Named for Philipp Friedrich von Siebold, of Leyden, an associate of Professor Schlegel.)

6. Genus ETELIS Cuvier and Valenciennes.

Etelis CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 2, 1828, p. 127 (*carbunculus*).
Elastoma SWAINSON, Nat. Hist. Fishes, vol. 2, 1839, pp. 168, 202 (*oculatus*).
Hesperanthias LOWE, Fishes of Madeira, 1843, p. 14 (*oculatus*).
Macrops DUMÉRIL, Ichth. Analytique, 1856, p. 279 (*oculatus*).

Body elongate, covered with large scales; eye very large; preorbital very narrow; mouth moderate, the lower jaw projecting; maxillary scaly; canines in upper jaw only; no teeth on tongue or pterygoids; gill rakers long and slender. Dorsal fin deeply notched, rather short, its spines 10 in number, its soft rays not scaly; caudal very deeply forked, the upper lobe produced in the adult; pectoral fin falcate, the lower rays not produced; last rays of dorsal and anal produced; head naked above; skull with the interorbital area flat, separated from the occipital area by a transverse line, limiting the median and also the lateral crests; frontals wide in front, not cavernous, simply normally perforate; supraorbital margins crenate; periotic region little convex and with the bones thick, unpolished; prefrontals behind, with funnel-shaped foramina. The relationships of this genus have been repeatedly misunderstood, but, as Gill has shown, it belongs in the Lutianidae and has no special affinity with *Anthias*, *Perca*, or *Serranus*. In spite of the difference in the form of its dorsal, the relations of *Etelis* with *Aprion* are very close. The skulls in the two are almost identical, as has already been noticed by Poey and Gill. The genus probably contains but one species, a brilliantly crimson fish, beautiful in form and color, and widely distributed in the warm seas.

(ἔτελις, Etelis, a name used by Aristotle for some fish not now recognized.)

NOTE ON ETELINUS, NEW GENUS.

Type—Etelis marshi Jenkins.

In the species called *Etelis marshi* Jenkins, from Hawaii, the caudal is simply forked, the lobes being relatively short. This species should be the type of a distinct genus, which may be called *Etelinus* Jordan, defined by the less elongate form and the simply lunate caudal fin.

Etelinus marshi bears a superficial resemblance to the genus *Doderleinia*, formerly called *Eteliscus*. *Etelinus*, like *Etelis*, lacks the supplemental maxillary and opercular spines. These are present in *Doderleinia*.

12. ETELIS CARBUNCULUS Cuvier and Valenciennes.

ONBUTSU (Male Mutsu.)

Etelis carbunculus CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 2, 1828, p. 127, pl. 18 (Seychelles).

Etelis carbunculus JORDAN and SNYDER, Check List, Ann. Zool. Jap., vol. 3, 1901, p. 77 (after *Serranus oculatus* Temminck and Schlegel).

Serranus oculatus CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 2, 1828, p. 266, pl. 32 (Martinique).—TEMMINCK and SCHLEGEL, Fauna Japonica, Poissons, 1843, p. 5 (Nagasaki).

Hesperanthias oculatus LOWE, Fishes Madeira, 1843, p. 14 (Madeira).

Centropristis oculatus MÜLLER and TROSCHEL in Schomburgk, Hist. Barbados, 1848, p. 666 (Barbados).

Macrops oculatus DUMÉRIL, Ichth. Analytique, 1856, p. 279.

Anthias oculatus GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 92.

Etelis oculatus GILL, Proc. Acad. Nat. Sci. Phila., 1862, p. 447.—STEINDACHNER and DODERLEIN, Beitr. Fische Japans, I, Akad. Wiss. Wien, vol. 47, 1883, p. 15 (Tokyo).—JORDAN and SWAIN, Proc. U. S. Nat. Mus., 1884, p. 468 (Martinique, Madeira, Barbados, Jamaica, Cuba).—JORDAN and FESLER, Sparoid Fishes, p. 457.—JORDAN and EVERMANN, Fishes North and Middle America, vol. 2, 1898, p. 1282, pl. 201, fig. 524.

Etelis evurus JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23, p. 184, for 1902 (1903) (Hilo).—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23, p. 242, for 1903 (July, 1905) (Hilo and Honolulu).—SNYDER, Bull. U. S. Fish Comm., vol. 22, p. 527, for 1902 (1904) (Honolulu).—JORDAN and SNYDER, Bull. U. S. Bur. Fish., vol. 26, p. 213, for 1906 (1907) (Hawaii).

Habitat.—West Indies to Madeira, and East Indies, north to Japan and Hawaii.

Description.—Of two specimens from Honolulu, Hawaiian Islands, cotypes of *Etelis evurus*, about 340 mm. in total length, and one from Havana, Cuba (typical of *Etelis oculatus*) between which no differences are discernible.

Head $3\frac{1}{5}$ in body length; depth $3\frac{4}{7}$; eye $3\frac{1}{3}$ in head; maxillary $2\frac{1}{7}$; snout $3\frac{1}{3}$; suborbital width 13; interorbital (bone) 4; D. X, 11; A. III, 8; scales in longitudinal series 53, in transverse 5 or 6/12, on cheeks in 7 rows. Gill-rakers 8 or 9+15 or 16.

Body elongate, fusiform, but tapering more posteriorly; somewhat compressed, its width $1\frac{3}{4}$ in depth. Head conical; interorbital space

broad and flat, straight in profile; snout rounded, blunt, arched somewhat from tip to above nostrils; preorbitals very narrow posteriorly under center of very large eye, broader anteriorly, its margin sinuate; lower jaw longer than upper; maxillary ending under middle of eye, its distal breadth $\frac{1}{3}$ diameter of eye, mouth cleft somewhat oblique. Teeth in the inner band in both jaws minute, in the outer row slightly enlarged; teeth larger and more widely set in upper jaw; a moderate canine on either side at tip of premaxillaries; villiform teeth on vomer, in a /\-shaped band; teeth on palatines in narrow bands; tongue without teeth. Gill-rakers equal to length of gill filaments, with several rudiments in each limb anteriorly. Preopercular margins finely serrated, angle rounded, vertical limb only slightly oblique. Opercle ending in two broad, flat, indistinct projections.

Dorsal spines moderately stout, second and third longest, 2 in head, remainder rapidly decreasing in height to last, which is 3 in second, leaving dorsal fin deeply notched; dorsal rays about equal, 3 in head, save last which is slightly elongate, $2\frac{1}{2}$ in head; anal similar to soft dorsal, its last ray produced, its first soft rays when depressed reaching little beyond base of last ray; anal spines slender and regularly graduated, third about 4 in head. Caudal very deeply forked, upper lobe longer, almost filamentous, its length 4 times that of middle rays, or $1\frac{1}{3}$ in head. Pectorals falciform, reaching almost to anal, $1\frac{1}{5}$ in head.

Scales moderate in size; rows on body all parallel to lateral line. Opercle with 8 or 9 rows of scales; subopercle 2; interopercle 4; on cheek 7; maxillary scaled on exposed surface. Temporal region with graduated band of scales, four rows of five each. Remainder of head naked save for few imbedded scales on lower jaw. Dorsals, ventrals, and anal naked; a few scales on base of pectoral; caudal scaled on membranes nearly to tip.

The young have the caudal lobes nearly equal, but later the upper lobe becomes much the longer.

Color in life brilliant rose red, sides from level of eye abruptly silver, with rosy shades; snout, jaws, eye, and inside of mouth red; fins all rose-color, dorsal and caudal bright; ventrals and anal pale, former washed with red on center; axil pink; pectoral pale rosy. Color in alcohol uniform pale yellowish, tips of caudal somewhat dark.

This species attains a length of 2 or 3 feet.

From comparison of specimens we can find no difference whatever between *Etelis oculatus* Cuvier and Valenciennes, and *Etelis evurus* Jordan and Evermann. The upper caudal lobe is the same in the two, as is the size of the scales and of the eye. Careful measurements in hundredths of body length show no differences in any detail more

than individual variation. *Etelis carbunculus* Cuvier and Valenciennes, of the Seychelles Archipelago, has, according to current descriptions, apparently no characteristic distinguishing it from *E. oculatus* except possibly in color. In the original description and figure given by Cuvier and Valenciennes, golden, longitudinal lines are shown, but the specimen was young, 11 inches in length, and these lines if ever existing, may vanish with age.

If these lines are characteristic of *Etelis carbunculus* at all ages, the species of the Seychelles may be different, in which case the common species may stand as *Etelis oculatus*.

We have seen no Japanese examples of this beautiful fish. It is common in rather deep water about Hawaii, as also about Cuba, from both of which regions we have ample material.

The species is known in Japan as Onbutsu; *on* meaning male, and Mutsu, the large eyed *Scombrops boops*, which it resembles. In Hawaii, it is called Ulaula, which means ultra red, "red-red." It is the Cachucho of the Cuban fishermen.

(*carbunculus*, a diamond.)

7. Genus APHAREUS Cuvier and Valenciennes.

Apharcus CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 6, 1830, p. 485 (*cærulescens=furcatus*).

Body elongate, somewhat compressed, covered with moderate scales; skull essentially as in *Etelis;* preopercle entire; snout and jaws scaleless; mouth large, the teeth in jaws, minute or deciduous, without canines; no teeth on vomer or palatines; maxillary rather narrow; lower jaw strong; the chin prominent; dorsal low, continuous, the last soft ray produced; anal similar; both fins scaleless; pectoral long, its lower rays also produced in the adult; caudal deeply forked; ventrals inserted below pectorals. Probably but one species, widely distributed.

(*ἀφάρεος*, a word used by Aristotle, of unknown meaning, perhaps "une nageoire particulière à la femelle du Thon." Farés is an Arabic name of the fish, a fact which suggested the use of *Aphareus*, a Greek name of similar sound.)

13. APHAREUS FURCATUS (Lacépède).

Labrus furcatus LACÉPÈDE, Poiss., vol. 3, 1801, pp. 424, 477, pl. 21, fig. 1 (Île de France).

Aphareus furcatus GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 386 (after Cuvier and Valenciennes).—BLEEKER, Verh. Kon. Akad. Wet., XIII, Revision Lutjani, 1873, p. 99.—BLEEKER, Atlas Ichth., vol. 8, 1877, p. 80, pl. 299, fig. 2 (labeled *A. rutilans*) (Amboyna).—GÜNTHER, Fische Südsee, 1873, p. 17 (Tahiti).—SAUVAGE, Poissons Madagascar, 1891, p. 514 (Madagascar).—JORDAN and STARKS, Proc. U. S. Nat. Mus., vol. 23, 1901, p. 719, pl. 28 and 29 (Odawara) (skeletal characters).

Aphareus furcatus JORDAN and SEALE, Fishes Samoa, Bull. U. S. Bur. Fish., vol. 25, 1905, p. 265 (Hawaii).—JENKINS, Bull. U. S. Fish. Comm., vol. 22, 1902, p. 51 (Honolulu).

Caranxomorus sacrestin ("Sacré chien") LACÉPÈDE, Poiss., vol. 5, 1801, p. 682 (Île de France).

Aphareus cœrulescens CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 6, 1830, p. 487, pl. 167 *b*. (Port Louis, Île de France).

Aphareus rutilans CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 6, 1830, p. 490 (Red Sea).—BLEEKER, Act. Soc. Scient. Ind. Neerl., vol. 2, Achste Bijd. Vischf. Amb., 1856, p. 52 (Amboyna); Atlas Ichth., 1877, pl. 299, fig. 2 (Amboyna).—RÜPPELL, Neue Wirbel., Fische, 1835, p. 121 (Red Sea).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 1, 1859, p. 386 (Red Sea, Amboyna).—KLUNZINGER, Syn. Fish. Roth. Meer., Verh. Zool-bot Ges. Wien, vol. 20, 1870, p. 768 (Red Sea); Fische Rothen Meeres, pt. 1, 1884, p. 45 (Red Sea, in deep water).—SAUVAGE, Poissons de Madagascar, 1891, p. 514 (Madagascar).—DAY, Fishes India, 1888, p. 782 (Ceylon).

Aphareus flavivultus JENKINS, Bull. U. S. Fish. Comm., vol. 19, 1901, p. 390, fig. (Honolulu).—JENKINS, Bull. U. S. Fish. Comm., vol. 22, 1902, p. 451 (Kona, Hawaii).—JORDAN and SEALE, Fishes Samoa, Bull. U. S. Bur. Fish., vol. 25, 1905, p. 265 (Hawaii).—JORDAN and EVERMANN, Fishes Hawaii, Bull. U. S. Fish. Comm., vol. 23, 1903, pt. 1, p. 235, fig. (Honolulu, Kailua, and Hilo).—JORDAN and DICKERSON, Proc. U. S. Nat. Mus., vol. 24, 1908, p. 611 (Honolulu).

Habitat.—East coast of Africa, Red Sea, Indian Ocean, East Indies, north to China, Japan, and Hawaii.

Description.—Of a specimen 580 mm. in total length, from Odawara, Sagami Bay, Japan.

Head $3\frac{1}{3}$ in body length; depth $3\frac{4}{7}$; eye $5\frac{1}{2}$ in head; maxillary $1\frac{5}{8}$; width of preorbitals $8\frac{1}{2}$; snout $2\frac{4}{5}$; D. X, 11; A. III, 8; scales in lateral line 72, between dorsal and lateral line 9, between ventrals and lateral line 18, between anal and lateral line 15; vertebræ 10 + 13 + hypural = 24. Branchiostegals 7.

Body fusiform and symmetrical, compressed, dorsal and ventral profiles similar; lower jaw projecting, its tip square and at right angles to cleft of mouth, which is somewhat oblique. Maxillary ending below posterior half of eye. Preorbital somewhat turgid, anteriorly produced slightly below edge of skin on snout. Nostrils small, close together, one-third of length of snout from eye. Teeth lacking save for slight roughening anteriorly in jaws. Preopercle with smooth margin, its angle produced somewhat posteriorly.

Dorsal spines weak and flexible, third, fourth, and fifth longest, $2\frac{2}{3}$ in head; last two-thirds length of fourth; first ray unbranched, but articulated, equal in length to last spine; last ray produced, probably 2 or 3 times length of penultimate. Pectoral falcate, contained $1\frac{1}{10}$ times in head, reaching anus; its lower rays produced, its margin therefore sharply incised; ventrals contained $1\frac{3}{4}$ times in head, extending half way to front of anal. Anal spines weak, first very short, second and third subequal, $5\frac{1}{2}$ times in head; anal rays equal in length to dorsal rays, last one produced similarly to that of dorsal; caudal deeply forked.

Rows of scales on body horizontal; equal in size above and below lateral line. Snout, upper surface of head, preorbitals, mandibles, and margins of preopercle naked; temporal patch with four transverse rows, six longitudinal; preopercle with six rows of scales, opercle, sub-and interopercle completely scaled; a small patch on base of pectorals, and densely crowded rows on interray membranes of caudal to tips, none on other fins.

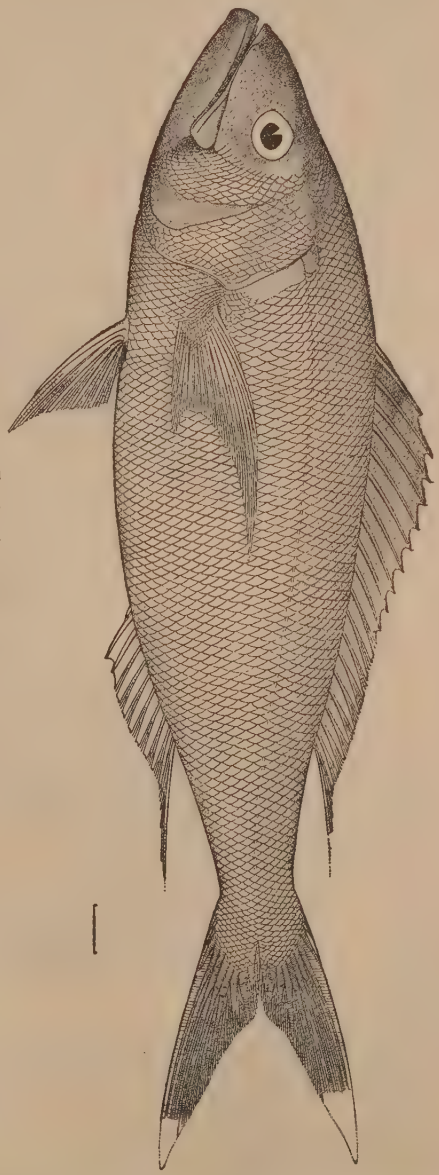

FIG. 7.—APHAREUS FURCATUS.

Color of old alcoholic specimen silvery, slightly darker above. Naked parts of head dark brown, darker on upper edge of mandibles, and below end of maxillary. Fins pale. In life reddish brown, the forehead (*flavivultus*) sometimes bright yellow.

The synonymy of this species is very difficult to decide. *Aphareus rutilans*, as described by Cuvier and Valenciennes, differs from *Aphareus furcatus* in having the fourth, fifth, and sixth dorsal spines longest, and, according to Günther[a] and also Klunzinger, the pectoral rays are produced below, the depth is less than the head, the snout is longer, and the eye smaller. The two last-mentioned authors had specimens 14 inches and 70 cm. in length, respectively, and some of the differences, as those in depth of body and size of eye can safely be attributed to age. The lower lobe of the pectoral becomes longer with age, as stated by

[a] Südsee Fische.

Bleeker[a] ("ætate provectioribus radiis sub inferis mediis longioribus"). As far as concerns the length of the dorsal rays, *A. furcatus* is said to have the third spine longest, thus differing from *A. rutilans*, but our specimen has the third, fourth, and fifth subequal. Should these nominal species prove distinct, our specimen would be *A. rutilans*, but the differences shown at present do not indicate any real distinction.

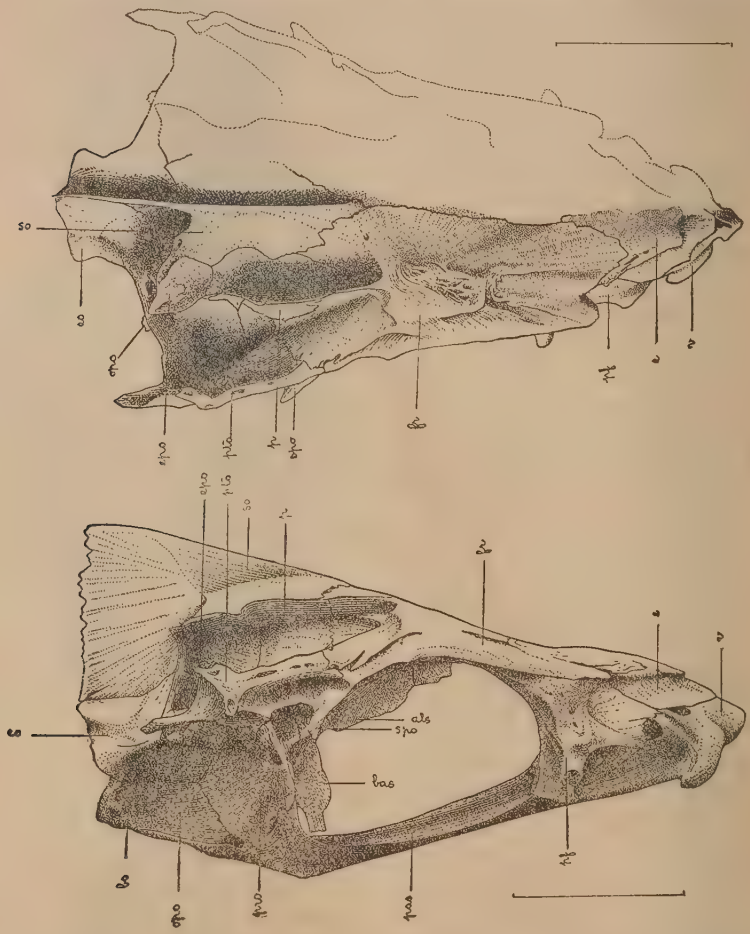

FIG. 8.—CRANIUM OF APHAREUS FURCATUS. *als*, ALISPHENOID; *bas*, BASISPHENOID; *bo*, BASIOCCIPITAL; *e*, ETHMOID; *eo*, EXOCCIPITAL; *epo*, EPIOTIC; *fr*, FRONTAL; *opo*, OPISTHOTIC; *p*, PARIETAL; *pas*, PARASPHENOID; *pf*, PREFRONTAL; *pro*, PROOTIC; *pto*, PTEROTIC; *so*, SUPRAOCCIPITAL; *spo*, SPHENOTIC; *v*, VOMER.

Aphareus flavivultus Jenkins, from Honolulu, apparently differs from *A. furcatus* only in the presence of a bright yellow area on the dorsal surface of the head, agreeing in other respects with it. Klunzinger, in describing the color of a specimen of *A. rutilans* from the

[a] Atlas, p. 80.

Red Sea, mentions yellow spots and lines on the upper surface of the head, and other authors give slightly differing color notes for the species, showing it variable to a certain degree. In two small specimens from Honolulu, in the Stanford collections, this color has faded away entirely in alcohol, leaving the dorsal surface of the head a dark brown in one case and much lighter in the other.

But one specimen of this fish has been recorded from Japan. This was presented to Jordan and Snyder by Professor Mitsukuri. It was kept for some time in the Imperial University collections under the name of the "Unknown Fish from Odawara." This specimen has been described in detail by Jordan and Starks, who have also given a full account of its osteology. Its affinities are plainly with *Etelis*.

(*furcatus*, forked.)

SUMMARY.

Family LOBOTIDÆ.

1. *Lobotes* Cuvier, 1829.

1. *surinamensis* (Bloch) 1790; Misaki.

Family LUTIANIDÆ.

2. *Glaucosoma* Temminck and Schlegel, 1843.

2. *burgeri* Richardson, 1846.

3. *Doderleinia* Steindachner, 1883.

3. *berycoides* (Hilgendorf), 1879; Awa.

4. *Lutianus* Bloch, 1790.

§*Evoplites* Gill, 1862.

4. *kasmira* (Forskål), 1775.

§*Lutianus* Bloch.

5. *vitta* (Quoy and Gaimard), 1824; Misaki, Tokyo, Yokohama, Wakanoura, Kobe Onomichi, Hakata, Kawatana, Nagasaki.
6. *russelli* Bleeker, 1849; Yokohama, Tokyo, Misaki, Shimezu, Wakanoura, Kagoshima.
7. *erythropterus* Bloch, 1790.
8. *rivulatus* (Cuvier and Valenciennes), 1828.
9. *vaigiensis* (Quoy and Gaimard), 1824; Tanegashima.

5. *Pristipomoides* Bleeker. 1852.

§*Platyinius* Gill, 1863.

10. *sparus* (Temminck and Schlegel), 1843.

§ *Ulaula* Jordan and Thompson, 1910.

11. *sieboldii* (Bleeker), 1857; Fukaura.

6. *Etelis* Cuvier and Valenciennes, 1828.

12. *carbunculus* Cuvier and Valenciennes, 1828.

7. *Aphareus* Cuvier and Valenciennes, 1830.

13. *furcatus* (Lacépède), 1801; Odawara.